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Contributions

Normal Clear or Normal Danger?

Boston, June, 1898.

To the Editor of the "Railroad Gazette:"

I have read with much interest the article in your issue of March 25 on "Electric Circuits for Automatic Signals," and would like to make a few brief statements in reply. They are based on several years' experience of the practical working of both "normal safety" and "normal danger" systems:

(1). A combination of circumstances is possible with any system of signals ever invented, automatic or manual, whereby a clear signal can be shown when a danger signal should be given. It is not a defect at all peculiar to the normal danger system.

(2). It is a fact that in several years' use of quite a large number of these signals such a case has not happened, to the writer's knowledge.

(3). It is a fact that may not be known to the writer of the article, that certain precautions can be taken which make derangements in the normal danger system as likely to be discovered as if the signals stood normally clear.

(4). It is a fact that tests of this system can be made as conveniently and as certain in their results as in any other system, but they are made in a different way. It is constantly being done, where these signals are efficiently maintained.

(5). It is a fact that if "an observer or trainman" is so conveniently near, or so watchfully alert when a normally clear signal goes wrong he may also happen to be on the ground when a normal danger signal does not work properly and discover the cause.

(6). It is a fact, according to the writer's experience, that these signals are less liable to derangements, cost less for material and labor for maintenance, and give better results than any others. He knows of no instance where they have once beeen used where they have not always afterward been given the preference.

(7). The writer believes that the principle involved in their construction is so valuable that it will come to be recognized as having relatively quite as important advantages for automatic signals as a closed electric circuit has over an open one.

(8). He believes that if the author of the article referred to had ever actually maintained a system of normal danger signals constructed with the modern safeguards he would never have written his article.

GEO. W. BLODGETT.

High Steel and Alternating Strains.

New York, June 8, 1898.

To the Editor of the Railroad Gazette:

A paper presented at the late meeting of the American Society of Mechanical Engineers, entitled "Carbon Contents of Piston-Rods as Affecting Their Endurance," by Joseph E. Johnson, Jr., in abstract published in recent number of your journal, is interesting.

The deductions from experience had relating to piston rods of locomotives, seeming to indicate that their term of service is increased by making them of harder or higher carbon material than of lower, is correct.

The matter, however, is not new. The failure of these piston rods was due, doubtless, to the work imposed upon them, causing extension and compression, measured by the ability of the material to resist the same; the greater these movements were (the effect of shock not being considered) the earlier would these rods fail.

Years ago a prominent maker of steel was asked to supply the best material for what is known as the "pitman" of mowing machines, which consists of a short crank attached to the lower end of a round rod perhaps a foot long between bearings, and ¾ in. in diameter. The request came from a company using large numbers of this particular part. The manager instituted a series of experiments, whereby pitmans made from any selected material might be subjected to a severe test—which was, that they should be revolved about 6,000 times a minute, a proper load being attached to the crank arm. He began with the best quality of wrought iron, somewhat similar to what used to be termed "Lowmoor," a soft and strong material, and ended with high carbon steel. The result of his experiments showed that the latter was superior for this purpose, and the reason for it is plain. Under the very frequent reciprocating stress of the load, the rod itself being at each revolution deflected between its bearings within its limits of elasticity in one direction and then in the other, the central point exhibited heat, which soon was so far increased because of the work there imposed upon it, that it became red, then white and finally parted. The stiffer the rod the less in extent were these deflections; hence, those made of high carbon were better able to endure.

In the paper presented, a similar reciprocating stress imposed upon the piston rods was noted; the softer the material used—or, in other words, the longer its extensibility under a particular stress, the greater was the resulting work done by it, and the less its capacity was to resist without failure.

OLD FELLOW.

Electric Automatic Signals—The Right to Use the Overlap.

The decision in the suit of the Union Switch & Signal Co. against the Philadelphia & Reading Railroad, the results of which we announced in our issue of June 3, page 395, is of much importance and it seems well to make a synopsis of the text which has now reached us. This was an equity suit brought in the Circuit Court of the United States for the Eastern District of Pennsylvania, in October, 1894. On May 26, 1898, Judge Acheson, sitting in that court, rendered a decision for the defendant and dismissed the bill of the complaint with costs. The defendant was, technically, the Philadelphia & Reading Railroad, but actually the Hall Signal Co., the latter company having assumed the defense by way of protecting its customer.

Suit was brought for infringement of five patents, which were: October 26, 1880, to Oscar Gassett; August 30, 1881, to Gassett, both "for electric railway signaling apparatus"; January 16, 1883, to George Westinghouse, Jr., "for improvements in electric circuits for railway signaling"; May 4, 1880, to Oscar Gassett and Israel Fisher, "for a connector for electric track circuits," and March 6, 1883, to Charles J. Means, "for improved means for attaching a conducting wire to the rails of the track." The last two patents in suit are of moderate importance, being for rail bonds and only covering questions of specific means of bonding.

The first three patents involved broad questions of automatic signaling by track circuit and especially protecting the rear of a train by more than one signal displayed, and by what is known as the "overlap." The decision now rendered shows that the principles of this art are open to the world and that the patentee can only hope to control specific means for accomplishing the purposes.

Before the date of the earliest of the patents in suit, automatic signaling actuated by the moving train by means of electrical connections was in common use. Signals were made to display danger, caution and clear, and "it was common to maintain at least two protecting signals to the rear of a moving train. . . . . All of this was part of the art as practiced anterior to any of the inventions of the patents sued on."

In 1872, Sykes & Francis took out a British patent, covering the automatic operation of signals by track instruments and wire circuit. In this patent distant signals were not only contemplated, but specifically mentioned. In 1873, Carr & Barlow took out a British patent for improvements in automatic electric signaling, also using a wire circuit and providing for a distant signal to perform the duties now commonly assigned to such signals.

April 20, 1875, Henry Flad took out a United States patent for automatic signals "embodying the principle of overlapping signals." In his specifications he says that "at least one signal is at all times left to the rear of the train, the train reversing the second signal to its rear." He says further: "This is what I denominate my system of overlapping signals, as the pipes or other means of communication overlap or run past each other." Flad's preferred communication was pneumatic, but he stated that hydraulic or other specified means may be employed and particularly that "the communication between the train and the signal may be by electricity." The judge says that any electrical engineer of ordinary skill, acting upon the suggestions of Flad's opinion, could have successfully applied it to overlapping signals worked automatically by the train through electrical connections."

Furthermore, the overlap relation of safety signals is a main feature of the United States patent of April 21, 1874, granted to Hall. The Hall overlap was in practical use for a considerable time, beginning about 1873, in Massachusetts. An overlapping space of 500 feet in length was used and during the passage over this space a train was protected by two signals behind it.

So far we have dealt with wire circuits. August 20, 1872, William Robinson took out a United States patent which in the opinion of the court "was a very great improvement upon the track instrument system." He specifies the control of signals without the use, or with a limited use, of line wire, the rails of the track being used for conducting the electric current. He provided a normally closed circuit with the signal normally at safety. Robinson specified also the means for working not only a home but a distant signal, and on August 29, 1879, he took out a British patent covering his closed circuit system and mentioning means of operating the additional signals.

We come now to the patent in suit. In the first Gassett patent provision is made to operate a signal by a track circuit extending the entire length of the insulated section, the electro-magnet controlling the action of the signal "being in its turn controlled through the electric circuit by a movable circuit closer attached to the train." In Gassett's specifications he points out the necessity for the overlap and says that "it is the object of his invention to provide such, so that each circuit is, as heretofore, under the direct control of the train while the latter is traversing its own section, but, in addition to this, is also indirectly under the control of the train through the agency of the next signal circuit in the series while the said train is traversing a certain portion of the next signal section." Gassett then describes Robinson's closed circuit system and adopts Robinson's apparatus and method in their entirety. His disclosed improvements upon Robinson "consist in continuing the exhibition of the danger signal set at the entrance of a track section until the train has passed over a certain portion of the track section next in advance, thus securing two danger signals rearward of the train while it is traversing the overlap."

Infringement is alleged of the third and fourth claims of this first Gassett patent.

The third claim is for the combination of track divided into sections, signaling apparatus controlled by an electro-magnet, circuit closer controlled by a moving train and a circuit breaker controlled by a moving train, which acts to continue the exhibition of the danger signal by interrupting the current through its magnet while the train is traversing part of the next succeeding section.

The fourth claim is for the combination of a series of two or more normally closed circuits and a series of circuit breakers, one for each circuit, each of which circuit breaker is controlled by a magnet included in the next circuit in the series.

The second Gassett patent is also based upon Robinson's closed circuit system and makes the same acknowledgement, but claims improvement over the first Gassett patent, whereby the same result is accomplished in a more reliable manner. It is, in fact, a mere improvement. In the first patent an insulated splice was interpolated somewhere in the section between two signals. In the second patent two splices were put in; that is, one in each of the opposite rails, but at the same point in the track. There are differences in the arrangement of magnets and circuit breakers, but the result is the same as that aimed at by the earlier patent. The exhibition of the danger signal is continued during the passage of the same train over the adjacent sub section of the next signal section ahead. Infringement of the third claim of this second patent is alleged, this claim being for the combination of a secondary circuit for actuating a magnet controlling a signal and two independent circuit breakers placed in this secondary circuit and two independent primary signaling circuits controlling the action of the circuit breakers, which primary circuits are themselves actuated successively by a train.

The Westinghouse patent (Jan. 16, 1883,) claims among other things the combination of a track circuit and relay magnet therein and signaling circuit opened and closed by such relay, and at least two signals in such circuit, one of which is arranged at or near the entrance end of each such track circuit, and the other at the required distance to the rear. Infringement of this, the fourth claim of the Westinghouse patent, is alleged. The plaintiff's expert says "that this invention, like those of Gassett, is founded upon the Robinson system. The signals are so arranged that normally a current flows through them and they are held at safety. Under train action

the current ceases to flow in the main track magnet, the circuit breaker breaks the circuit of the signals and they show danger."

The court says that this latter patent (the Westinghouse) need not long engage our attention. The question of alleged infringement may be set aside. There is complete defense on other grounds. The patent was issued Jan. 16, 1883. If, as alleged, it was applied for Nov. 16, 1882, no earlier date can be given to Westinghouse; but there is clear proof that two years before that earliest date the invention described in the Westinghouse patent, and covered by this fourth claim, was in practical and public use on about ten miles of track of the Chicago, Burlington & Quincy. It was operated theer for about two years. It was installed by the Union Electric Signalling Co. The only reply attempted to this defense is that the installation was in the nature of an abandoned experiment, but this reply is held to be against the clear proof.

Furthermore, an article on the Union Electric Signal system was published in the Railroad Gazette March 12 and April 2, 1880, which contained a complete description of the invention of the Westinghouse patent, and which article was a publication to the world of this invention. This, briefly, is the ground on which the Westinghouse patent is dismissed.

The court next considers and describes the defendant's (Hall) system of signals which are operated according to the Robinson closed circuit system, "which has been free to the public since 1889." With this apparatus in the normal position all track circuits are closed, all signal circuits are broken, and all signals stand at danger. A home signal is used and in the rear of that is placed a distant signal, which performs the normal and proper duties of the distant signal, namely, indicates the position of the home signal.

It is not pretended that any infringement of the Gassett patent is found in the defendant's home signals or the manner of their operations. To that extent the Robinson system has been followed. The alleged infringement of Gassett is in the use of the distant signals. "These signals, however, are set, shifted and operated by Robinson's method and not otherwise. Nothing is borrowed from Gassett. The supposed violation of the plaintiff's rights consists exclusively in the fact that the distant signal is set to danger, while the home signal on the same post makes that showing and that it continues at danger during the passage of the train over the second track section in advance." The court points out, however, that this distant signal has functional relation only with the home signal ahead, and not with the home signal on the same post with itself, and that the system of home and distant signals antedated Robinson and that Robinson's method, as well as the earlier track instrument method, was applicable to working signals standing in the home and distant relation; that to add to Robinson's patent a signal to repeat to the rear the showing of the block signal would have been an obvious expedient to a skilled electrical engineer, even had the patent been silent with respect to such additional signal, but the patent gives express directions for carrying back information to the rear and using additional signals. "No invention was involved in carrying back a wire to a signal at a distant point in the rear to give cautionary notice to the engineer of an approaching train of the condition of a forward block. This is a legitimate exercise of Robinson's invention now open to the public."

Furthermore, the feature of preliminary notice to a following train of the condition of the track section second in advance is not taken from Gassett. It is altogether wanting in his patents. The engineer stopped by the Gassett signal at the entrance of a section cannot tell whether the train ahead is in that section or in the overlap still further in advance.

Where is Gassett's real improvement? He addressed himself to introduce an overlap into a Robinson-operated system, the whole organization being intended and devised to secure the continued exhibition of the danger signal at the entrance of a block while the train is traversing a definite portion only of the next signal section in advance, and to attain this object each of his patents disclosed specific means.

Neither of Gassett's patents shows pioneer invention. Overlaps and the setting of two danger signals behind the train were old in the art. "Gassett may have been the first to use an overlap with a Robinson-worked system, but if so his patents gave him exclusive right only to the means which he specified to produce his described result. Anyone may lawfully accomplish the same end without infringing his patents, if he uses means substantially different."

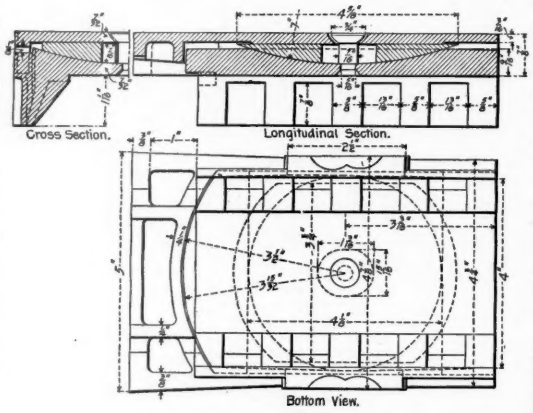
The above is only a synopsis, more or less imperfect, of the long line of consideration and reasoning by which the court is brought finally to the conclusion that "in structure, operation, purpose and result these two organizations of signaling circuits and apparatus are essentially different, and that the defendants are not shown to have infringed either of the Gassett patents."

It is not necessary to take space to describe the two bonding patents, being the fourth and fifth patents in suit, infringement of which is alleged. The court shows that such patents must be narrowly construed strictly limited to specific means described, and that the method used by Hall does not infringe the patents in suit.

Adjustable Journal-Bearing Keys.

One of the new car appliances which will be exhibited at the M. C. B. Convention is an adjustable journal-bearing key, the joint invention of Mr. A. M. Waitt and Mr. H. F. Ball of the Lake Shore & Michigan Southern Railway, which will shortly be put on the market by the National Railway Specialty Co., Chicago. This key is so designed as to be interchangeable with the M. C. B. standard key, and at the same time insure a uniformly distributed load over the entire journal-bearing under all conditions of service.

Among the conditions which result in eccentric loading with the present standard parts may be

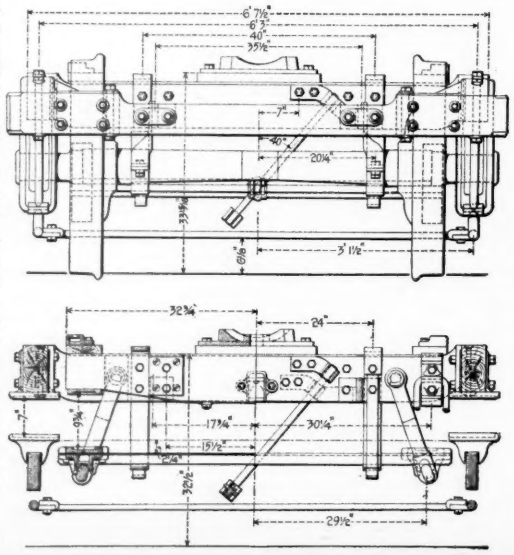


Adjustable Journal Bearing Key.

mentioned the spreading of the pedestals or bottoms of the truck frames, equalizer or box springs out of position and bearing faces of equalizers not in parallel planes. These act to throw the journal box out of its normal position and bring the load upon the key at a point on one side of the center of the journal. An eccentric load on the M. C. B. key produces an unequal load on the brass, which raises the unit pressure to such a degree as to affect the lubrication of the journal and cause unequal wear. This unequal loading is commonly accepted to be one of the chief causes of hot boxes.

The accompanying engraving shows the adjustable bearing key for 4¼x8-in. journals, and it will be seen that it consists of three malleable iron plates loosely connected by a rivet. The upper plate comes in contact with the top of the box, and the lower plate with the brass. The middle or adjusting plate has a spherical lower surface, and is free to slide in any direction. In this way the upper surface of the bearing key can adjust itself to the box so that the load is uniform on the top plate, and this load is distributed to the brass uniformly by the key. No matter how the box may be inclined, the brass maintains its normal position with respect to the journal.

These keys have been used for several months on the Lake Shore & Michigan Southern Ry. with very satisfactory results. In one particular case a new brass fitted with the M. C. B. key, after making 4,900 miles in passenger service, was found to have had a bearing at one end only, the lead lining, which was originally about $\frac{1}{16}$ in. thick, being worn entirely away at one end and scarcely worn at the other. A new brass was then put in the same box with the adjustable key, and after making the same mileage there was no preceptible wear, as the brass had had an even bearing throughout. We understand that some of the brasses which have been in service will be exhibited at the Convention.



Pennsylvania Standard Passenger Truck.

[*Omitted last week by mistake. See page 406.*]

The Traffic of the Sault Ste. Marie Canals.

The official report of the freight and passenger traffic to and from Lake Superior for the month of May, 1898, is received. This covers both the United States and the Canadian canals at Sault Ste. Marie. The totals for the month were as follows:

East-bound freight, net tons	2,137,729
West-bound freight, net tons	524,252
Total freight, net tons	2,661,981
Registered tonnage, United States	2,052,003
Registered tonnage, Canadian	441,298
	2,493,301

A classified table of statistics of the traffic at the Soo for the year 1897, and also for each year since the opening of the canal in 1855, is given. The first year in which the number of vessels is given is 1864. Then the sailing vessels through the canal were 1,045, and in 1897 they were 4,438, having increased in number nearly 4¼ times. The steamers through the canal in 1864 were 366, and in 1897 they were 12,029, having increased nearly 32⅘ times in number. The registered tonnage is given for 1855 as 106,296. In 1897 it was greater than any year before, namely, 17,619,933 registered tons.

The great items of freight are coal, flour, wheat, grain other than wheat, iron ore and lumber, although salt is no small traffic. The quantities of these items carried in 1855 and in 1896 were as tabulated below, but in three instances the quantities are not reported for 1855. In those cases the earliest year reported appears in parentheses:

	1855.	1897.
Coal, net tons	1,414	3,039,172
Flour, barrels	10,289	8,921,143
Wheat, bushels	(1870) 49,700	55,924,302
Grain	(1856) 33,908	24,889,688
Salt, barrels	587	285,449
Iron ore, net tons	1,447	10,633,715
Lumber, feet	126,000	805,612,000
Total freight, net tons	(1881) 1,567,741	18,982,755

The estimated value of freight carried through the American canal in 1887 was $79,031,757; in 1897 it had risen to $218,235,927. In the latter year the value of the flour was something over 40 millions, of the wheat over 48½ millions, of the copper nearly 24½ millions, iron ore 32 millions, lumber almost 11 millions, and unclassified freight 34¾ millions. The estimated cost of carriage per ton-mile has fallen from 2.3 mills in 1887 to 0.83 of a mill in 1897.

Largest Boiler Plates Ever Rolled.

The Illinois Steel Co., at its South Chicago Works, on June 3, rolled two of the largest open hearth steel boiler plates ever made in this country, each of which will be used as the shell surrounding the firebox of a consolidation locomotive. These two engines are now building at the Richmond Locomotive Works for the Cleveland, Cincinnati, Chicago & St. Louis, and are similar to one shown in our issue of April 15 last, excepting that the boiler of the engine illustrated had horizontal side seams in the rear sheets. Both boilers of the new engines will be of the extended wagon-top type, 64 in. in outside diameter at the front end.

In the two engines now building the rear sheet is to be continuous, the only longitudinal joints being at the mud ring on either side. Mr. William Garstang, Superintendent of Motive Power of the road, says that his object in adopting this construction is to avoid the side seams, which are objectionable, as the radial stay-bolts have to pass through the welt strips, and are thus more liable to break than those screwed into the single sheets. Also, as strong a shell is obtained by using a $\frac{9}{16}$ in. solid plate as would be given by one with about 20 per cent. greater thickness, so that this weight is saved, amounting to nearly 1,000 lbs. for each engine.

Each of the finished plates was 124 in. wide, and 220 in. long on one edge and 237 in. on the other; the original sheets before the shearing were 128 in. by 360 in. for one and 130½ in. by 375 in. for the other, while the ingots from which they were rolled had a cross-section of 18 in. by 40 in. The actual gage of one plate measured at the four corners was 0.577 in., 0.577 in., 0.574 in., and 0.576 in., while at the ends near the middle the gage was 0.640 in. and 0.623 in.

The weight of each of the original ingots was 8,700 lbs., the estimated weight of the finished plate 4,517 lbs., while the actual weights were 4,940 lbs. and 4,960 lbs., respectively. It will thus be seen that but little more than 50 per cent. of the ingot was used, 7 ft. being cut from one end of the plate (top of ingot) and 3 ft. from the other end (bottom of ingot).

Great care was taken, both in making the ingots and rolling the plates, the ingots being made from a special melt of steel under the direction of Mr. C. E. Stafford, Manager of the Open Hearth Department, while the plates were rolled, personally, by Mr. W. C. Clyde, Superintendent of the Plate Mill. The mill used is what is termed a "three-high Lauth mill," being the largest plate mill in this country. This mill has three rolls, each 132 in. long in the clear, the top and bottom rolls being each 36 in. in diameter, and the middle roll 22 in. in diameter. It is driven by a 54 in. by 66 in. Porter-Allen engine of

3,000 H. P. The difficult part of rolling such large plates is to maintain the full width for a distance of 20 or 30 ft.; short plates even wider than those described being much easier to roll on this mill.

These plates were inspected by Mr. T. L. Condron of the Pittsburgh Testing Laboratory, Ltd., under the standard specifications of the Master Mechanics' Association for shell steel. The report of the test shows that all surfaces were practically perfect. The furnace analysis of the melt from which the ingots were cast is as follows:

Carbon	0.20 per cent.
Manganese	0.38 "
Phosphorus	0.028 "
Sulphur	0.027 "

Tensile tests were made from each plate, and the results of these tests are as follows:

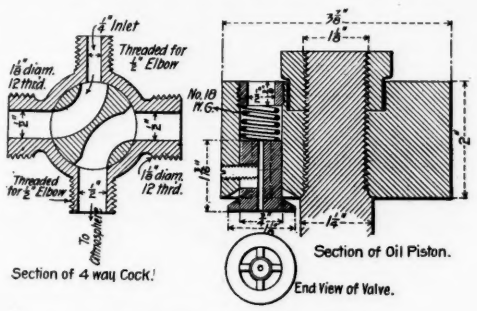
Mark.	—F - 1.—	—F - 2.—
Original dimensions, in. x in....	0.997 x 0.585	0.995 x 0.576
Original area, sq. in.	0.5832	0.5731
Elastic limit, lbs. per sq. in.	44,760	37,690
Tensile strength, lbs. per sq. in..	62,930	58,810
Per cent. of elongation in 8 in..	26.75	26.50
Per cent. of reduction in area...	56.27	62.83

The cold bending tests and quench bending tests showed that this material could be so bent, flat on itself, without sign of fracture.

Pneumatic Press with Oil Resistance Cylinder—New York, Ontario & Western Railway.

The accompanying engraving shows the principal features of one of the portable pneumatic presses which are now being successfully used in the Middletown and Norwich shops of the New York, Ontario & Western Railway. Presses operated by air and having an air cylinder only have been found to be objectionable for certain kinds of work, such as pressing out bushings where the load on the ram is suddenly removed, as under these conditions the press is subjected to severe shocks; the arrangement shown was designed by Mr. George W. West, Superintendent of Motive Power of the New York, Ontario & Western, to overcome the objection to the usual type of pneumatic press.

It will be seen that there is an air cylinder 24 in. in diameter by 19¼ in. between heads, making the full stroke about 16 in. long. This cylinder is supported by four 2½-in. standards, fixed to a heavy cast iron platform, which is mounted on 8-in. wheels. A tripod is bolted to raised seats on the upper head of the air cylinder, and into the apex of the tripod is screwed a piece of 3¾-in. water pipe, 29¾ in. long, having a cap at its upper end. This pipe forms an oil cylinder which is filled through a plug opening in the cap. The rod to which the air piston is attached is reduced, above the piston, from



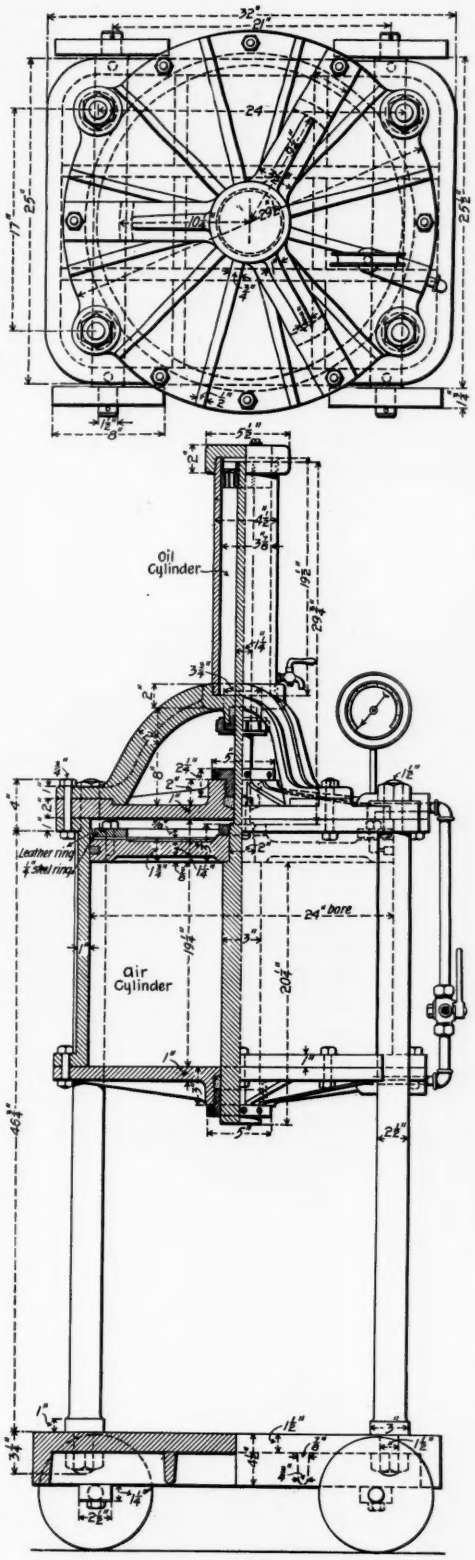
Detail of Pneumatic Press.

3 in. to a diameter of 1¼ in. and extends through suitable stuffing boxes into the oil cylinder, where to its upper end is attached a 3⅞-in. piston. The oil piston, shown in detail, has a ¾-in. opening extending from one side to the other in which is placed a valve which is closed by an upward pressure; when seated there still remains a ⅛-in. opening through the center of the valve.

The oil cylinder forms a dash pot and absorbs any sudden shocks, but offers no material resistance to the ram when working under normal conditions. When the press is working light and there is no resistance at the end of the ram the piston in the oil cylinder is forced against the oil, producing a pressure below the oil piston which closes its valve, so that the oil is gradually forced through the small hole in the valve and the speed thus regulated; this opening in the present machine is ⅛ in., but for quick working a larger hole would be used. When the work offers a resistance to the ram the pressure below the oil piston is not sufficient to compress the spring, so that the valve remains open, permitting the oil to flow freely between the ends of the cylinder as the ram is lowered and offers no resistance. The oil passage is also fully open when the ram is raised. The press described was filled with oil over a year ago, and as yet has not required refilling.

The air pipe connections are made in the usual way, but a special form of four-way cock is used to control the machine. This cock is shown in section, and it will be seen that the outlet port in the plug is cut away at the outer edges, so that the air can be exhausted from one end of the cylinder without admitting air to the opposite end. The air pressure is indicated by a gage, made by the Star Brass Mfg. Co., Boston, which is graduated to show the pressure in lbs. per sq. in. on the piston, and also the number of tons pressure on the ram.

The press was designed for a working pressure of from 80 to 85 lbs. per sq. in., equivalent to a total pressure of about 20 tons on the ram, and has been found especially useful for such work as forcing in and outdriving box brasses and bushings in rods,



Pneumatic Press with Oil Resistance Cylinder—New York, Ontario & Western Railway.

links and other locomotive parts. It is said that one man with this machine is able to do as much work as four or five men can do using the old style screw press.

Specifications.

At the last meeting of the Western Railway Club Mr. J. C. McMynn, of Robert W. Hunt & Co., introduced the subject of railroad specifications for discussion, and, in view of the reputation of this firm in commercial testing, Mr. McMynn's statements should have considerable weight. One of the common sources of trouble is that few have the gift of writing clear, concise specifications, even when they have the necessary knowledge and experience to know what sort of material is suitable. The inspector is usually the first to find out the weak points in a specification, and his ideas, if he is experienced, are likely to be of practical value. The following is taken from Mr. McMynn's paper:

Specifications, if drawn intelligently and compiled correctly, are of great assistance to both the purchaser and the manufacturer, by expediting business transactions and also in preserving friendly relations between those parties, through avoiding misunderstandings, etc. But if drawn with a view to favor certain articles under the pretense of being fair to all, they often lead to disagreeable consequences and serious disputes.

The definition of the word specifications, as given by Webster, is "A written statement containing a minute description or enumeration of particulars, as the terms of a contract."

Many specifications, especially those sent out by manufacturers, are in reality only descriptions of their particular productions, and have no right to be honored by the term specifications. For instance, the descriptions sent out by some bicycle manufacturers and by them called specifications—their only claim to the name lies in the fact that they have the different paragraphs headed by type of different color and of larger size. Specifications sent out by many boiler makers and manufacturers of various metal articles are of the "limited" kind, because they describe only the article manufactured by one particular party. But those with which a railroad man has to deal are such as will permit various concerns to bid or attempt to do the work in accordance with the particular views of that road. Specifications should be drawn under the supervision of the head of a department, as the one most conversant with the proposed use of the article. They should be of sufficient length and detail to avoid any misinterpretation by either party, but in case of a misunderstanding it would seem that the originator of the specification should be sole judge of the intention, even if expressed vaguely, since the manufacturer has ample opportunity to ask for information on any point not clearly understood. In the management of a railroad it is usually the case that the actual purchase is made by the purchasing agent, but the purchasing agent should not change or interpret the specifications without first consulting the person who drew them.

Time was when the pioneer in the manufacture of any special article attained such prominence by the superiority of his output that his name was a guarantee for the perfection of his goods, and prices were such that he was not tempted to run the risk of sending out an inferior article. Heavier traffic, with its increased loads, has rendered changes necessary, and with sharper competition the former high standards in manufacture have, in many cases, been lowered. In certain lines new processes have rendered it possible to lessen the cost of materials and at the same time to greatly improve the quality. Hence, it seems only a natural outcome of progress that the purchaser of to-day should specify clearly just how he wants a locomotive or a car or a bridge built, or of what chemical composition and of what physical properties he wants his rail or boiler steel made.

However, if a superintendent of a railroad department is satisfied with an article of a certain make, there is no reason why he should hesitate to call upon the purchasing department to supply it. The purchasing agent may use all of his diplomacy to obtain a low price, but it seems useless and unjust to other makers for him to draw specifications and give them to understand that they are open to competition, when he knows that they stand no chance of obtaining the work.

We have already seen how inefficient are the specifications for couplers recommended by the Master Car Builders, and I would call your attention to the specifications for boiler tubes adopted in 1895, by the Master Mechanics. Under these specifications, even if rigidly adhered to, it is possible either to accept or reject any make of tube. The method of making the pin test is not clear or explicit enough to avoid misinterpretation either through ignorance or intent.

There are other specifications of a like nature, and I wish it could be made the province of this club to take up such matters by means of committees, who could make experiments and make recommendations to be discussed by the various national associations, which meet but once a year.

Railroad Engineering at Purdue.

We are in receipt of a pamphlet from Purdue University announcing the courses for next year in railroad engineering and railroad management. The courses cover railroad equipment, strength of railroad material, railroad structures, electric railroad practice, railroad chemistry, economies, car sanitation and railroad surveying. The laboratory equipment is being increased, and the method of presenting these subjects will be by illustrated lectures, laboratory work, and the study of cars, locomotives and their appliances from full-sized specimens. For the latter purpose a large collection of special railroad equipment is being made.

The track connecting the Lake Erie & Western and the University buildings is to be used for experimental purposes as a track laboratory. This is a new feature that has never been developed. The locomotive testing plant and the Vauclain compound model we have often referred to, but in the list of apparatus are mentioned several recent additions, namely, a full-size model of the cylinders and front end of a Richmond compound locomotive, an injector testing plant, the M. C. B. brake shoe testing machine, a locomotive air pump testing plant, and two systems of car lighting arranged for testing.

The lectures by railroad men, which were a special feature during the past year, are to be continued, and the following lectures have already been arranged for: Mr. W. H. Baldwin, President, Long Island Railroad, "The Routine of a Railroad President"; Mr. Charles B. Dudley, Chemist, Pennsylvania Railroad, "The Application of Chemistry to the Railroad"; Mr. William Forsyth, Mechanical Engineer, Chicago, Burlington & Quincy, "The Part of a Mechanical Engineer in the Organization of a Railroad"; Mr. Addison C. Harris, Attorney at Law, Indianapolis, "Railroad Law"; Mr. E. M. Herr,

Superintendent of Motive Power, Northern Pacific, "The Construction and Maintenance of Railroad Equipment." The subjects of the lectures by Mr. J. N. Barr, Superintendent of Motive Power, Chicago, Milwaukee & St. Paul, and Mr. J. F. Wallace, Assistant Second Vice-President, Illinois Central, will be announced later.

A Comparison of Fiber Stresses in Crank Pins and Axles.

By L. R. Pomeroy.

In designing crank pins having a single bearing the question which usually determines the dimensions is one of wearing surfaces, and consequent freedom from heating. That is to say, a pin that is large enough, from the bearing standpoint is usually of ample dimensions to provide a safe working fiber stress. Pins with more than one bearing, such as the main pins of mogul, 10-wheel or consolidation locomotives, present an entirely different proposition. In the latter case pins that are large enough to provide a good, safe working fiber-stress are ample in size to fulfill the requirements for a good bearing. Judging from numerous examples which have come under our notice in the past, this point has not always been considered, for we have known of pins so small that the limiting fiber-stress was above 19,000 lbs., and even as high as 28,000 lbs. per square inch, and the breakages that have been investigated have invariably been with pins working under such severe conditions. The last two years, however, has witnessed a marked improvement in this respect. Investigations concerning the proper dimensions of crank pins and driving axles, covering a period of six years have led us to conclude that the limiting fiber-stress of crank pins should be for:

Steel, 15,000
Iron, 12,000 } pounds per square inch.

and for driving axles:

Steel, 21,000
Iron, 18,000 } pounds per square inch.

Where the pins are figured by the formula:

$$S=\frac{0.7854\ D^2\ P\ L}{R}$$

and for driving axles:

$$S=\frac{0.7854\ D^2\ P\ b^t}{R}$$

where

R=moment of resistance=$0.0982d^3$ (d=diam. pin or axle).

D=diameter of the cylinder.

P=boiler pressure.

L=lever arm.

S=fiber-stress in pounds per square inch.

b^t=equivalent bending moment, due to combining the bending with the twisting moments; where the lever arm for the bending moment, b, is the distance from the center of the main rod bearing on pin to the center line through the frame or driving box, and the lever arm for the twisting moment, t, is taken as one-half the stroke of the piston, combined as follows:

$b^t=\frac{1}{2}D^2\ 0.7854\ Pb+\sqrt{b^2+t^2}$.

b=bending moment, and

t=twisting moment.

The mortality in driving axles under a certain class of consolidation locomotives which came under the writer's notice was very large. Upon investigation it was found that the dimensions were such that they were working under a fiber-stress of from 28,000 lbs. to 30,000 lbs. per square inch (the fiber-stress figured as per foregoing formula). As many as three of this class of engines has been noted in the shop at one time for this difficulty. And on another occasion an examination made of the axles of five similar engines which were in the shop for other causes showed that four engines out of the five had cracked driving axles.

With this data in mind, we have arranged the following table showing the material, dimensions and fiber-stress on pins and axles taken from modern engines. We have included the diameter of the piston rods, from which we have derived the formula $0.0135D\sqrt{p}$, which, we think, will give the proper diameter of piston rods where D = diameter of cylinder and p = boiler pressure.

The Lone Star Case.

History.

On July 15, 1897, the Miami Steamship Company (the "Lone Star Line") put on a line of freight steamers between New York City and Galveston, Tex. Prior to that time the New York and Texas Steamship Company (Mallory Line) enjoyed a monopoly of this traffic. The new line proved to be a formidable rival. It reduced rates, producing utter demoralization and really causing the subsequent demoralization of rail rates in southwestern territory. Various attempts were made to bring about a restoration of rates, without success. The Texas rail lines during the season of 1897 accorded to both steamship lines equal facilities for through billing, but no settlement being in sight they notified the Lone Star Line of the discontinuance on Feb. 15, 1898, of all through billing arrangements, and that thereafter they would accept no freight for or from the Lone Star Line unless the charges were prepaid. The latter thereupon, on Feb. 12, brought suit in the United States Circuit Court for the Eastern District of Texas for an injunction against the roads. On March 2 Judge McCormick issued his temporary injunction. The railroads appealed to the United States Circuit Court of Appeals, and on March 29 the later court dissolved the injunction and remanded the cause.

The Complainant's Bill.

The Steamship Company, in its bill praying for an injunction, made the Gulf, Colorado & Santa Fe, the International & Great Northern and the Missouri, Kansas & Texas defendants. The bill set up the following:

That the steamship line is a common carrier, whose steamships are amply fitted for the service. That its facilities at Galveston are as good as the Mallory Line's.

That both lines had been accorded through rates to and from Texas points and charges had followed goods in the customary manner.

That the Southwestern Freight Bureau had entered into a conspiracy with the Morgan, Cromwell and Mallory lines, all members of the Bureau, to prevent the plaintiff from carrying on its business, by adopting an agreement to discontinue through rates with steamer lines not members of the association (meaning the plaintiff, the only line not a member), and by demanding the prepayment of freight.

That by so doing the defendants "threaten and intend to unlawfully and wilfully violate the laws of the United States," to grant the Mallory Line "undue and unreasonable preference," and prevent the Lone Star Line from doing business.

That the railroad companies have agreed with the Mallory Line for through rates at less than the sums of the locals; rebating, up to 35 cents per 100 lbs., charges paid by the Mallory Line on freight received at points outside New York City, and allowing the Mallory Line an arbitrary of 35 cents between New York and Texas points.

Answer of the Railroads.

The Missouri, Kansas & Texas, of Texas, in its answer alleged that the Miami Steamship Company had been carrying freight between New York and Galveston at irregular times and at varying and unpublished rates; that the only connection between defendant's line of railroads and complainant was through the wharf of the Galveston Wharf Company; that the appliances and accommodations of the Mallory Line were superior to those of the Lone Star. It was admitted that prepayment had not been required, but it was denied that there had been any established custom and usage to that effect; this privilege could be granted or withheld at the pleasure of the railroad; there had been no custom or usage establishing a right to either line to participate in through rates and billing; whenever this had been

FIBER STRESSES IN PISTON RODS, CRANK PINS AND DRIVING AXLES.

Road.	Type.	Cylinder.	Boiler pressure.	Piston rods. Diameter.	Piston rods. Material.	Piston rods. Formula: D = diameter rod; p = boiler pressure.	Crank pins (main). d	Crank pins (main). l	Crank pins (main). d	Crank pins (main). l	Crank pins (main). Material.	Crank pins (main). Fiber stress.	M in Driving axles. Diameter.	M in Driving axles. Material.	M in Driving axles. Distance center of cylinder to center line of frame.	M in Driving axles. Fiber stress.
(A)	Mogul.	In.	Lbs.	In.			In.	In.	In.	In.		Lbs. per sq. in.	In.		In.	Lbs. per sq. in.
P. R. R.	Simple	20 × 26	185	3½	S	0.013 D √p	7⅛	5½	5½	6½	S	14,500	8½	S	22	22,600
P. B. & L. E.	"	20 × 26	180	3½	S	0.013 D √p	6½	5½	6	6	Nickel S	17,700	8	S	21½	26,000
I. C.	"	19½ × 26	180	3½	S	0.013 D √p	6¼	5	6	6	S	17,900	8	S	20	23,500
D. S. & S.	"	22 × 28	160	4	S	0.014 D √p	7⅛	5	6½	6	S	11,800	9	S	20¾	19,400
C. B. & Q.	"	19 × 24	160	3	S	0.013 D √p	5¾	5	5	5½	S	18,500	8	S	20	19,600
N. E.	"	20 × 26	200	3¾	S	0.012 D √p	6⅛	5¼	6	6	S	22,500	8	S	20	27,500
(B)	10-Wheel.															
L. S.	Simple	18 × 24	190	3	S	0.012 D √p	5½	4¾	4¾	6	S	21.800	8½		19½	16,100
A. T. & S. F.	"	19½ × 28	180	3¼	I	0.013 D √p	6¼	5	6	6	I	17,900	8½	I	21	20,000
C. & N. W.	"	19 × 26	190	3¼	I	0.013 D √p	6½	5	5½	6	I	16,000	8½	I	21	20,000
G. T.	"	20 × 26	200	3¾	S	0.013 D √p	7½	5¼	6½	6	S	12,500	9½	S	22½	18,000
S. Ry.	"	21 × 28	200	3¾	S	0.013 D √p	7	5	6	6	S	16,300	8½	S	21¼	26,000
P. & W.	"	20 × 26	180	3½	S	0.013 D √p	6½	5½	6	6	S	17,700	8	S	21	25,800
M. C.	"	19 × 24	180	3¼	S	0.013 D √p	6¼	5¼	6	5½	S	17,000	8	S	20½	22,500
N. P.	Compound	22 × 34 × 26	200	3½	Nickel S	0.011 D √p	6½	5¼	6	6	Nickel S	23,000	9	S	21¼	24,400
W. C.	Simple	19 × 26	200	4	I	0.014 D √p	7	4¼	6¼	6	I	12,200	9	I	19	16,600
B. & O.	"	21 × 26	190	3½	S	0.012 D √p	6½	5¼	6	6	S	20,000	8	S	21	29,900
Erie	"	20 × 24	160	3¼	S	0.013 D √p	6	5½	5½	6	S	20,000	7½	S	19½	25,700
Mex. Cent.	"	20 × 24	180	3½	S	0 013 D √p	6¼	4⅝	6	6	S	17,300	8	S	19⅜	23,600
I. & G. & N.	"	19 × 24	180	3⅜	S	0.013 D √p	6¼	5	5½	5½	S	16,400	9	S	19	14,700
(C)	Consolidation.															
Big 4.	Simple	20 × 26	190	3½	S	0.013 D √p	6½	5¼	6	6½	S	18,700	8½	S	22	23,000
P. R. R.	H⁴ simple	22 × 28	185	4	S	0.0134 D √p	7⅝	6	6	7	S	14,500	9	S	21½	22,800
"	H⁸ "	23½ × 28	185	4	S	0.0125 D √p	8½	6¾	6	7½	S	13,800	9	S	23	27,600
B. R. & P.	Simple	21 × 26	180	4	I	0.014 D √p	7¼	5	6¼	6½	I	14,200	8½	I	21	23,000
N. Y., N. H. & H.	"	21 × 26	180	3¾	S	0.013 D √p	6⅝	5½	6½	6	S	18,500	8⅝	S	19½	21,000
U. P.	"	20 × 24	180	3¾	I	0 014 D √p	6	5½	5½	5¼	I	21 000	8	I	16½	20,000
A. T. & S. F.	"	21 × 28	180	3¾	I	0.013 D √p	6½	5	6	6⅜	I	19,000	8	I	20	23,000
P. Jn.	"	22 × 28	160	4	S	0.014 D √p	6½	5½	6	6	S	19,000	8½	S	21	22 900
N. & W.	Compound	23 × 35 × 32	200	3½	Nickel S	0.011 D √p	7	5	6½	7	Nickel S	20,700	8½	Nickel S	20¼	31,600
T. P. & W.	Simple	20 × 24	180	3½	S	0.013 D √p	6¼	5¾	6	6½	S	21,000	8	S	21	25,500
B. & O.	"	22 × 28	180	4	S	0.0135 D √p	6½	5¾	6½	6	S	22,000	8½	S	21½	26,000
(D)	12-Wheel (Mastodon).															
Mex. Cent.	Simple	21 × 26	180	4	I	0.0137 D √p	7⅜	5	6½	6½	S	13,600	8½	I	2 ½	23,000
Gt. N.	"	21 × 34	210	4¼	S	0.014 D √p	7⅜	5	6½	6½	S	15,700	9	S	21½	24,800
C. & E. I.	"	21 × 26	200	4	S	0.0135 D √p	7	5¼	6½	6½	S	17,000	8½	S	21½	24,600
N. P.	Compound	23 × 34 × 30	200	3¾	Nickel S	0 012 D √p	7	5¼	6½	6	Nickel S	20,000	9	S	21¼	27,000
C. B. & Q.	Columbia simple	19 × 26	200	3¼	S	0.013 D √p	6½	4½	6	6	S	15,700	8½	S	20½	21,000
L. V.	Atlantic simple	19 × 26	180	4	S	0.015 D √p	6½	4¼	5½	5½	S	13,200	8½	S	20½	19,000

done it was only by agreement between the parties in interest, which could be terminated at any time. The railway company denied that it was or ever had been a member of the Southwestern Freight Bureau or that it had entered into any conspiracy; further, it was averred that it gave the notice of Feb. 15 of its own volition. It had made the agreement with the Mallory Line because that was the line best equipped for the business and affording the best service, both in the interests of the railroad and the public; discrimination against the Lone Star Line was denied. The Lone Star Line is not subject to the Interstate Commerce Act and cannot by this proceeding avail itself of the benefits of a joint through rate, which can only be made with the consent of both parties and which is not obligatory on either.

The Gulf, Colorado & Santa Fe and the International & Great Northern filed separate demurrers to the bill, both alike, to the effect that the bill was defective in not joining as defendant the New York and Texas Steamship Company; that the bill did not show any illegal, wrongful combination or conspiracy; that the railroads had a legal right to make arrangements with one connection without making the same with others.

The Bill of Errors.

Judge McCormick granted the relief under his construction of the Interstate Commerce Law. The defendants appealed and assigned errors based on the arguments outlined above. It was averred that the defendants have the right to demand prepayment of charges from one connection without requiring it from another; that the bill fails to show discrimination under section 3 of the Interstate Commerce Act; the complainant, being a water-carrier, does not come under the protection of the act, and is not a connecting line within the meaning of the act; the controversy is between carriers, and the act was designed primarily for the protection of shippers against carriers, and not one carrier against another.

The Mallory Line, through its joint tariffs with the Missouri, Kansas and Texas Railway Company, of Texas, which are filed with the Interstate Commerce Commission, has rendered itself subject to the act to regulate commerce, while the Lone Star Line has not done so.

The Opinion.

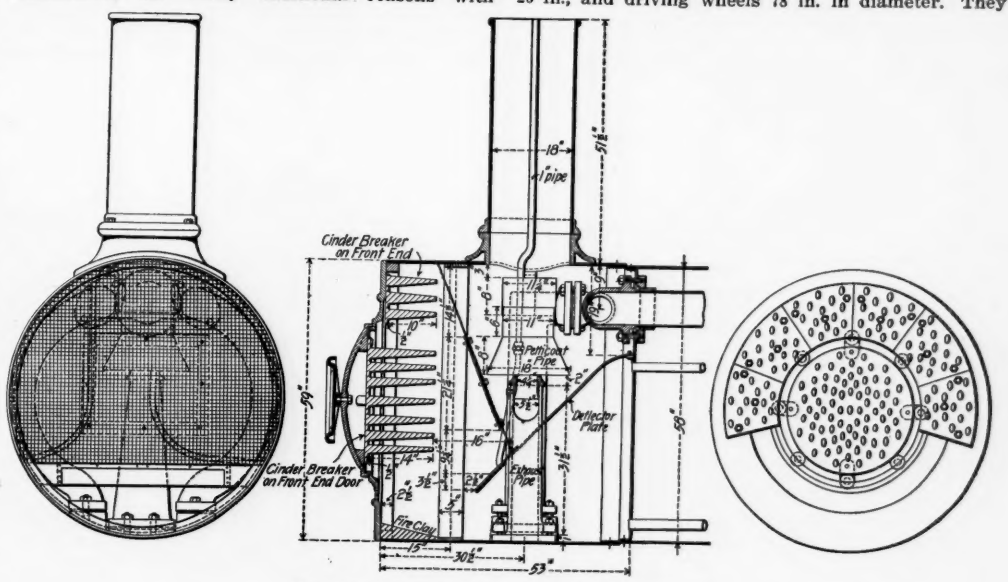
The Circuit Court of Appeals, after reviewing the case at length, gave as its opinion that the alleged agreement "that the Mallory line is to cancel all existing contracts or special arrangements with the Kansas City, Pittsburgh & Gulf on Missouri River business, and hereafter abide by rates and regulations fixed by this association," and "that all rates less than association basis between Texas points and all territories be withdrawn," would seem to affect the Lone Star line rather favorably than otherwise.

Regarding the argument of the railroad companies, in support of their action in withdrawing through billing arrangements and requiring prepayment of charges by the Lone Star line, that at common law a common carrier is not bound to carry except on its own line, and if it goes beyond it may in the absence of statutory regulations determine for itself what agencies it will employ, and its contract is equivalent to an extension of its line for the purpose of the contract; that if it holds itself out as a carrier beyond its line, it may nevertheless confine its carrying to the particular route which it chooses to use; that it may select its own agencies and its own associates for doing its own work (Atchison, Topeka & Santa Fe vs. Denver & New Orleans, 110 U. S. 667), the Court held that the steamship line had failed, either by oral argument or in the brief submitted, to weaken the force of this argument and its authority.

Section 3 of the act to regulate commerce provides that the paragraph shall not be construed as requiring any common carrier to give the use of its tracks or terminal facilities to another carrier engaged in like business. The various provisions of the act recognize the right of carriers to make through rates and joint tariffs as existing when the law was enacted, although the act itself does not expressly authorize them to do so, and the fact that the carriers were left free to make such contracts necessarily includes a freedom to decline to contract in case they cannot agree upon the terms, or in case they consider it to their interest not to contract on any terms. Congress did not give the Interstate Commerce Commission power to fix rates, and to compel the formation of through routes. The Commission was early impressed with the view that the statute was apparently designed to require connecting carriers to join in the formation of through routes at lower aggregate rates than a combination of their locals, and has repeatedly called the attention of Congress to the fact that it had failed to provide the machinery necessary to accomplish that purpose. "We think," the Court says, "that the case attempted to be made in the bill of complaint in the Circuit Court cannot be maintained under the Interstate Commerce Act."

The Court held that the arrangements in effect between the railroad and the Lone Star Line prior to the filing of the bill had not been of a sufficiently long standing to obtain the force of local custom; and that if they had it is beyond the power of a local custom to compel parties to contract, or to impose its terms on their dealings, against their expressed will or against the duly expressed will of either of them. The traffic in question being Interstate, and under the control of the Interstate Commerce Commission, the Texas statutes do not apply.

The bill does not claim that the complainant has any contract arrangement with the defendant railroads which the roads are about to break. It does not charge that they are obstructing the traffic of the complainant in any particular by violence or other affirmative action, or that plaintiff is not enjoying all the privileges accorded by defendants to other lines not connected with them by contract arrangement. It therefore is manifest that the Circuit Court has no power to grant the relief asked unless it has power to command the making of such contracts on the same terms afforded the Mallory Line. All the reasons which have prevailed with Congress to withhold this power from the Interstate Commerce Commission, and many additional reasons with strongest force, forbid that the numerous circuit courts should, in advance of legislative action, take jurisdiction, and by mandatory injunction compel such through routing, billing and rating.



The Coburn Front End and Spark Extinguisher.

Punctuality of the Black Diamond Express.

The record of the Empire State Express of the New York Central, which was published in the Railroad Gazette of May 13, page 335, has led the Lehigh Valley people to make a comparison with the record of the Black Diamond Express of that road for the same period—12 months, ending Dec. 31, 1897; and General Passenger Agent Charles S. Lee has sent us the accompanying table. It will be seen that the westbound train arrived at Buffalo within 5 minutes of schedule time on 287 days out of 313, or 92 per cent., and that the eastbound train made a similar good record on 290 days, equal to 93 per cent. of all the trips. The Lehigh Valley train has a slower schedule than that of the Central, but, on the other hand, there are much steeper grades to contend with, the train is usually heavier and there are more stops.

The schedule of the Black Diamond westward, No. 9 is 9 hours 55 minutes, including the ferry between New York and Jersey City, and of No. 10, eastbound, 9 hours 57 minutes. The distance is 447.53 miles, making the rate, including the stops, but not the ferry (one mile), 46⅓ miles an hour. There are 10 stops, consuming about 30 minutes, and 19 minutes is allowed for the ferry. The eastbound train is scheduled at 63 miles an hour for 44 miles. On many occasions when late, a speed of 80 miles an hour has been kept up for distances of 20 miles or more, and on April 21, 1897, this rate was maintained for 44 miles, Alpine to Geneva Junction.

These trains consist of five cars each, and as the café car, 86 ft. long, weighs 108,500 lbs., and the day cars 75,000 lbs. each, the whole train, exclusive of the engine and tender, must weigh something over 410,000 lbs. The locomotives which haul these trains weigh 140,900 lbs. each. They have cylinders 19 in. x 26 in., and driving wheels 78 in. in diameter. They have Wootten fireboxes, burning hard coal, and the average consumption of coal per train mile is 88 lbs.

The steepest grade encountered by the Black Diamond (eastbound), is 96 ft. per mile for 10 miles. The train surmounts an altitude of 1,739 ft. above the level of the sea. The causes of delay are shown below:

	No. 9.	No. 10.
Head winds and snow storms	4	..
Hot boxes	8	4
Freight trains ahead breaking in two	..	5
Engine failures	10	8
Steam failures	2	1
Steam hose bursting	1	..
Freight cars derailed	2	4
Broken rail	1	..
High water	..	1
Yard blocked	1	..
Cow on track	1	..
Connections	1	1
Leaves on rails	..	1
	31	25

RECORD OF BLACK DIAMOND EXPRESS FOR THE YEAR 1897.

No. 9—Westward, New York to Buffalo.

Month.	Trips.	Late.	On time.	Late at Buffalo (minutes). 5	10	15	20	25	35	40	45	50	55	60	65
Jan.	26	4	22	1	1	..	1	..	..	..	..	1	..	..	..
Feb.	24	1	23	..	..	..	..	1	..	..	..	..	..	..	..
Mar.	27	..	27	..	..	..	..	..	..	..	..	..	..	..	..
Apr.	26	4	22	1	2	..	..	1	..	..	..	..	..	..	..
May	26	1	25	..	..	..	..	..	1	..	..	..	..	..	..
June	26	2	24	..	..	..	..	..	..	1	..	..	1	..	..
July	27	2	25	1	1	..	..	..	..	..	..	..	..	..	..
Aug.	26	2	24	..	..	..	1	..	..	1	..	..	..	..	..
Sept.	26	3	23	1	..	1	1	..	..	..	..	..	..	..	..
Oct.	26	2	24	..	1	..	..	..	..	..	..	..	..	1	..
Nov.	26	2	24	.	1	..	..	..	..	..	..	1	..	..	..
Dec.	27	8	19	1	1	2	..	..	..	..	2	..	..	1	1
Totals	313	31	282	5	6	4	3	2	1	2	2	2	1	2	1

No. 10—Eastward, Buffalo to New York.

Month.	Trips.	Late.	On time.	Late at Jersey City (minutes). 5	10	15	20	25	30	40	45	50	55	65	70	80
Jan.	26	3	23	..	1	..	..	1	1	.	..	..	..	..	..	..
Feb.	24	2	22	..	1	..	..	..	..	..	..	1	..	..	..	..
Mar.	27	..	27	..	..	..	..	..	..	..	..	..	..	..	..	..
Apr.	26	..	26	..	..	..	..	..	..	..	..	..	..	..	..	..
May	26	1	25	..	..	..	..	..	..	..	1	..	..	..	..	..
June	26	3	23	1	.	..	..	1	..	..	..	..	1	..	..	..
July	27	2	25	..	..	..	..	..	1	..	1	..	..	..	..	..
Aug.	26	3	23	..	1	..	..	..	..	1	..	..	..	..	..	1
Sept.	26	2	24	1	..	1	..	..	..	..	..	..	..	..	..	..
Oct.	26	1	25	..	..	..	1	..	..	..	..	..	..	..	..	..
Nov.	26	5	21	..	1	..	..	..	2	2	..	..	..	..	..	..
Dec.	27	4	23	1	..	..	..	..	..	1	..	..	..	2	..	..
Totals	313	26	287	3	4	1	1	2	3	3	2	2	1	1	2	1

The Coburn Locomotive Front End and Spark Extinguisher.

We have on several occasions referred to the present tendency to limit the extension fronts of locomotives to the smallest possible dimensions and design the smoke box so as to be self-cleaning. The advantages to be gained by a small extension front and a self-cleaning smoke box are, first, the direct saving of some weight and material, and, second, there is saved the cost of cleaning the front ends and loading and unloading cinders. However, with the usual arrangement of netting the danger from fires being started by the sparks is an important consideration, and several mechanical men have been working on the problem of a self-cleaning smoke box that would not be open to this objection. The arrangement devised by Mr. W. P. Coburn, Assistant Master Mechanic of the Chicago, Indianapolis & Louisville Ry., will therefore be of interest as fulfilling these conditions.

It will be seen that a deflector plate extends well down toward the bottom of the smoke box, which turns the cinders and sparks coming from the tubes, toward the bottom of the front end. The exhaust acts to draw these upward through a system of cast iron projections fixed to the door and to the door ring above and at either side of the door. In passing through these projections the cinders are ground to a fine powder which has to pass through a fine mesh netting before reaching the stack. The netting extends from the top of the smoke arch to the deflector plate, to which it is connected as shown in the drawing. It has been found that by the time the pulverized cinders are thrown out at the top of the stack all fire is extinguished. The drawings also show how the door piece and segments forming the

base for the projections or cinder breakers are secured by bolts.

There are now in service on the Chicago, Indianapolis & Louisville nearly twenty engines having the new front ends, and the remainder are to be equipped as fast as the engines can be withdrawn from service. It has been found that the extension proper need only be made 15 in. long, and, as the exhaust keeps the smoke box perfectly clean the cinder chutes and slides can be entirely removed.

Master Car Builders' Reports.

Below are given the reports presented at the Saratoga meeting by the committees of the Master Car Builders' Association.

THERMAL TESTS FOR CAR WHEELS.

There are in service in the United States and Canada, approximately, 9,750,000 cast-iron car wheels, costing in round numbers $58,500,000. There are produced and put into service in this territory each year, approximately, 1,100,000 car wheels, at an estimated value of $6,600,000. The cast-iron car wheel is one of the greatest iron products of the United States, and one that is well worth preserving. The long continued use of the cast-iron wheel in this country particularly testifies to its great efficiency and economy, and to preserve this useful product, as to preserve any product of industry, requires its continual improvement. That the quality of the cast-iron wheel has been improved materially from time to time there is no doubt, but that it is in need of still greater improvement, it is thought, there is also no doubt.

At the last convention of this Association, one of the members presented some facts concerning the breakage of cast-iron wheels, and these facts being taken from authenticated records, it will not be out of the way to again quote them. There were removed during a period of four years and four months on the division of the Pennsylvania Railroad from Pittsburg to Philadelphia a grand total of 7,180 wheels, on account of being either cracked or broken, 6,446 being cracked and 250 being broken. The wheels removed comprised those produced by almost every manufacturer in the United States, and it can be safely stated that practically all cast-iron wheels are subject to cracking or breaking when subjected to service with which they are likely to meet on many of the railroads of the country. A careful examination of these wheels indicated that they were cracked or broken principally by the expansion of the rim, or because of internal strains, coming as a result of imperfect manufacture, so great as to produce rupture when in service.

During the past three years it has been fully demonstrated that cast-iron wheels can be produced which will resist satisfactorily the destructive force of sudden expansion of the rim, and which will not possess, to any material extent, internal strains. This has been demonstrated by actual service, and also by means of a test designed to reproduce, in a measure, the conditions of service, now commonly known as the thermal test. The fact that most manufacturers have no difficulty in producing wheels to comply with this part of the specifications, with but a small increase in cost, would indicate that it is quite practicable, even though it does not reproduce exactly the conditions of service. The fundamental principle of all specifications relating to material has for its basis the proving of ability not to stand the usual conditions alone, but extraordinary conditions, and this, too, with a good margin to spare, commonly known as the factor of safety. Therefore, if the thermal test is severe, it is properly so, but as stated above it can hardly be considered unreasonably so. It may be that the thermal test has certain disadvantages, and of this something will be said later, but the subject of this paper has to do more with the principle of the thermal test rather than with the detail.

Having spoken of the advantages of producing wheels that will stand the thermal test, the question arises whether any necessary qualities of the car wheel are thereby impaired. The opinion has been expressed that if wheels are produced so as to withstand the thermal test the mileage life will be very materially reduced. The writer has made an effort to obtain some figures to bear out this side of the case, but has been unable to do so. Those making the above assertion endeavor to demonstrate the correctness of their position by presenting figures showing the mileage life of wheels on some roads known to have one of the qualities spoken of above, and those on other roads having the other quality spoken of to a greater extent than the former. It might be stated that the wheel which is said to produce a greater durability of tread and flange contains a greater proportion of combined carbon, while the wheel that is best adapted to withstand the thermal test has a larger percentage of graphitic carbon.

It is necessary here to explain the method of arriving at such figures, which is as follows: If we have, for example, 10,000 wheels in service, and experience for a period of ten years shows that in order to keep the equipment in good condition it is necessary to renew 1,000 wheels a year, it is obvious that the life of each wheel in service will be ten years; or, in other words, if the number of wheels drawn and renewed each year is sufficient to keep the equipment in good condition, the life of the wheels is obtained by dividing the total number in service by the number drawn per year.

Without considering the various influences that may come into such a calculation in ordinary practice, this may seem an entirely correct method, but it only applies when the equipment remains the same from year to year. If additions are made to the equipment a disturbing influence is immediately introduced. Also, it is assumed that the total number of wheels put under an owner's cars by foreign roads is the same as are put under foreign cars by the owning road, and finally that the mileage made by owner's cars on foreign roads is equal to the mileage made by foreign cars on the owner's road. These assumptions may or may not be true, and whatever results are obtained the figures thus deduced can at best only be approximate.

The method indicated above is quite commonly used. As showing the inaccuracies of this method, however, it is only necessary to point to the following example:

According to this method, the life of wheels drawn during the year 1890 on one road was 7.4 years, while the life of wheels drawn on the same road in 1892 was 12.4. This difference in the life is due to the fact that for two years prior to 1890 large additions had been made to the equipment without a corresponding drawing of wheels; consequently the total number of wheels in service increased very greatly, while the renewals did not increase proportionately until 1892, and after. Again, in 1892 on the same road a very large addition to the equipment took place, with considerable diminution in the number of wheels drawn. This produced a very long life for such wheels as were drawn.

It must be evident, without argument, that there is no such violent fluctuation in the life of wheels under cars. If necessary allowances are made for the variations in the equipment, etc., above indicated, a very different result is obtained. For example:

If the average of the total number of wheels in service for five consecutive years be taken, and this sum divided by five, and the yearly average of the wheels drawn for the same five consecutive years be taken, then we obtain the average life in years for the wheels drawn, which applies with considerably greater accuracy to the last one of the five years in question. Again, if we drop the figures for the first year of the group and take the figures for the succeeding year, we obtain another average life of years corresponding to the wheels withdrawn during the last year, and so on.

If objection is raised to a period of five years, it may be stated that by increasing the period, greater will be the accuracy. The table given below shows the average life of wheels obtained on a road by each of the plans outlined above.

Average Life of Wheels in Years.

Year.	Five-year Plan.	Ordinary Plan.
1887	9	8.7
1888	8.5	8
1889	8.5	9.7
1890	8.4	7.4
1891	8.5	9.2
1892	9.2	12.4
1893	9.6	10.3
1894	9.6	9.5
1895	9.4	7.2
1896	9.3	8.8

Average Wheel Mileage.

Year.	Five-year Plan.	Ordinary Plan.
1887	114,936	105,824
1888	108,280	99,080
1889	106,256	115,232
1890	104,056	94,456
1891	105,504	108,640
1892	111,024	137,776
1893	113,364	109,984
1894	107,496	95,144
1895	102,829	80,008
1896	99,446	89,083

It will be observed that the violent fluctuations produced by the first method almost disappear by using the second method, and the life of wheels expressed in years is much the same from year to year, which is really what might be expected, there being no real reason why the average life of wheels should change very greatly.

If the latter method of computing the mileage life is used, the writer has been unable to find that wheels commonly known as "hard" wheels, having a greater proportion of combined carbon, show any longer life than those known as "tough" wheels, having less combined carbon but more graphitic carbon.

It is the chill given to the tread and flange of a wheel that enables it to be used, and that gives it its wearing qualities. The total mileage life of a wheel depends directly on the depth of the chill, as well as upon the quality, but if two wheels, both having the same quality of chill as well as the same depth, the one being made of iron of high combined carbon, known as hard iron, and the other being made of iron with low combined carbon, or the tough variety, it would certainly be expected that both wheels would give the same mileage life so far as the chill is concerned, but the latter would withstand the heating of the rim, or the thermal test, better than the former.

Through the General Superintendent Motive Power of the Pennsylvania Railroad, Mr. F. D. Casanave, and the chemist of that road, Dr. C. B. Dudley, I am able to present the following facts bearing on this point:

Twenty wheels were selected from those in service, representing some of the principal makes of the country, all of which were subjected to the thermal test, 10 passing it successfully and 10 failing. Chemical analyses were made of the iron of which these 20 wheels were made, two sets of samples being taken, one from the body, or gray iron, and the other from the chill. The result of these analyses is as follows:

Analyses of the Gray Iron. Stood Thermal Test.

Total Carbon.	Graphitic Carbon.	Combined Carbon.	Manganese.	Phosphorus.	Silicon.	Sulphur.
3.68	3.00	0.68	0.64	0.30	0.56	0.11
3.54	2.74	0.80	0.28	0.47	0.65	0.10
3.50	3.48	0.02	0.35	0.40	0.45	0.13
3.65	2.41	1.24	0.31	0.53	0.57	0.16
3.73	2.89	0.84	0.88	0.38	0.50	0.11
3.63	3.03	0.60	0.44	0.43	0.56	0.12
3.67	2.79	0.97	0.24	0.38	0.53	0.10
3.67	3.03	0.64	0.32	0.42	0.47	0.16
3.64	2.53	1.11	0.33	0.50	0.62	0.12
3.86	3.31	0.55	0.30	0.36	0.63	0.11

Did Not Stand Thermal Test.

Total Carbon.	Graphitic Carbon.	Combined Carbon.	Manganese.	Phosphorus.	Silicon.	Sulphur.
3.64	2.41	1.23	0.30	0.35	0.71	0.14
3.22	1.98	1.24	0.34	0.51	0.77	0.16
3.51	2.56	0.95	0.31	0.44	0.75	0.12
3.64	2.30	1.34	0.21	0.39	0.65	0.13
3.61	2.52	1.09	0.17	0.35	0.60	0.11
3.61	2.94	0.67	0.33	0.42	0.79	0.12
3.73	2.60	1.13	0.23	0.35	0.66	0.11
3.68	2.54	1.14	0.19	0.39	0.88	0.12
3.74	2.57	1.17	0.30	0.41	0.60	0.13
3.45	2.39	1.06	0.40	0.36	0.68	0.19

Analyses of the Chilled Iron.

Stood Thermal Test. Total Carbon.	Graphitic Carbon.	Combined Carbon.	Did Not Stand Thermal Test. Total Carbon.	Graphitic Carbon.	Combined Carbon.
3.90	0.43	3.47	3.90	0.34	3.56
3.71	0.32	3.39	3.37	0.32	3.05
3.73	0.42	3.31	3.71	0.43	3.28
3.70	0.55	3.15	3.75	0.78	2.97
3.87	0.41	3.46	3.74	0.49	3.25
3.77	0.55	3.22	3.77	0.30	3.47
3.84	0.35	3.49	3.86	0.48	3.38
3.84	0.40	3.44	3.80	0.41	3.39
3.71	0.49	3.22	3.82	0.29	3.53
4.01	0.30	3.71	3.56	0.36	3.20

These figures cover determinations actually made. It was not deemed essential to determine the phosphorus, silicon and manganese in the chills, as there was no reason to think that they would differ in proportion from the same elements in the gray iron. In reality all borings for the two analyses were obtained not over 3 or 4 in. apart in the same wheel, the one being from the gray iron in the plate and the other from the chill. It is well known that the difference between chilled iron and gray iron in the same casting is in the condition of the carbon. It will be noted that in the gray iron the graphite is pretty well toward three per cent., and that the combined carbon is toward one per cent., while in the chill the figures are reversed, the variations being not far from one-half of one per cent. The figures giving the analyses of the gray iron are given for a comparison and as a matter of information.

The main point in these analyses, to which special attention is called, is the close agreement in the composition of the chills of these different wheels. If we take the averages of those that did and those that did not stand the thermal test, we find as follows:

	Total Carbon.	Graphitic Carbon.	Combined Carbon.
Average of wheels which stood the thermal test	3.81	0.42	3.39
Average of wheels which did not stand thermal test	3.73	0.42	3.31

It will be noted that the graphitic carbon is the same in both cases, and that the combined carbon only differs .08 per cent. Furthermore, the general agreement of the combined carbon of the chills in wheels from different makers is very noticeable and very remarkable. It is difficult to see how any other conclusion can be drawn from these figures than that there are is no evidence, so far as the chemical composition is concerned, to show that the chills of wheels which stand the thermal test differ in their physical properties, so far at least as the physical properties depend on the chemistry of the metal, from the chills of wheels which do not stand the thermal test. Also, it seems fair to conclude that wheels made in different parts of the country and by different manufacturers do not differ very widely so far as chemical composition of the chills is concerned. It is quite obvious why this should be so, since the chill fixes the chemical composition within very narrow limits. Therefore, to emphasize what has been stated previously, it seems reasonable to conclude that the wear of wheels depends on the chill, and if chills of various wheels are as closely alike as these analyses show them to be there is really no evidence that the wear of these chills will differ to any appreciable extent.

Referring now to the manner of conducting the thermal test. The method now used may be criticised to some extent, and justly too, on the ground that it cannot be applied with absolute uniformity at all times and at all places—that is to say, in pouring the ring of molten metal around the rim of a wheel it is difficult, if not almost impossible, to have the iron always at exactly the same temperature, so that in some cases the test will be a little more severe, and in others a little less. The test recommended by the committee of the Association last year requires that this ring of metal be poured at a temperature as low as possible without producing seams or wrinkles. It is, of course, difficult to say exactly when the iron is at such a temperature, but it is believed that the foreman in charge of most wheel foundries is so experienced as to be able to tell very closely from the appearance when the iron has arrived at this temperature before pouring.

The writer has communicated concerning the thermal test with nearly all of the principal wheel manufacturers of the country, and they have been asked to suggest a method that will be more accurate. They have all given the matter considerable attention, and up to the present time have been unable to develop any plan that would be any more satisfactory and still thoroughly practicable.

The everyday use of the present thermal test has demonstrated its extreme simplicity, and with the one exception of possible variation in the temperature of the molten metal, it seems admirably adapted to the main purpose. As previously stated, the object of such a test is to produce conditions more severe than those of service, so that it may be known what margin of safety can fairly be counted on beyond. As to the magnitude of variation in the temperature of molten metal used for the test, it is believed that undue significance has been attached to this, and that there is a growing feeling that it is so inconsiderable as to give practical uniformity.

The great majority of the wheel makers of the country state that there is no difficulty in producing wheels which will stand the present test, and that the test itself is satisfactory. This being the case, and in view of the facts here given, it would seem that the thermal test ought to commend itself to users of wheels as a satisfactory way to the purchase of that which is desired with all the certainty possible, viz., safety.

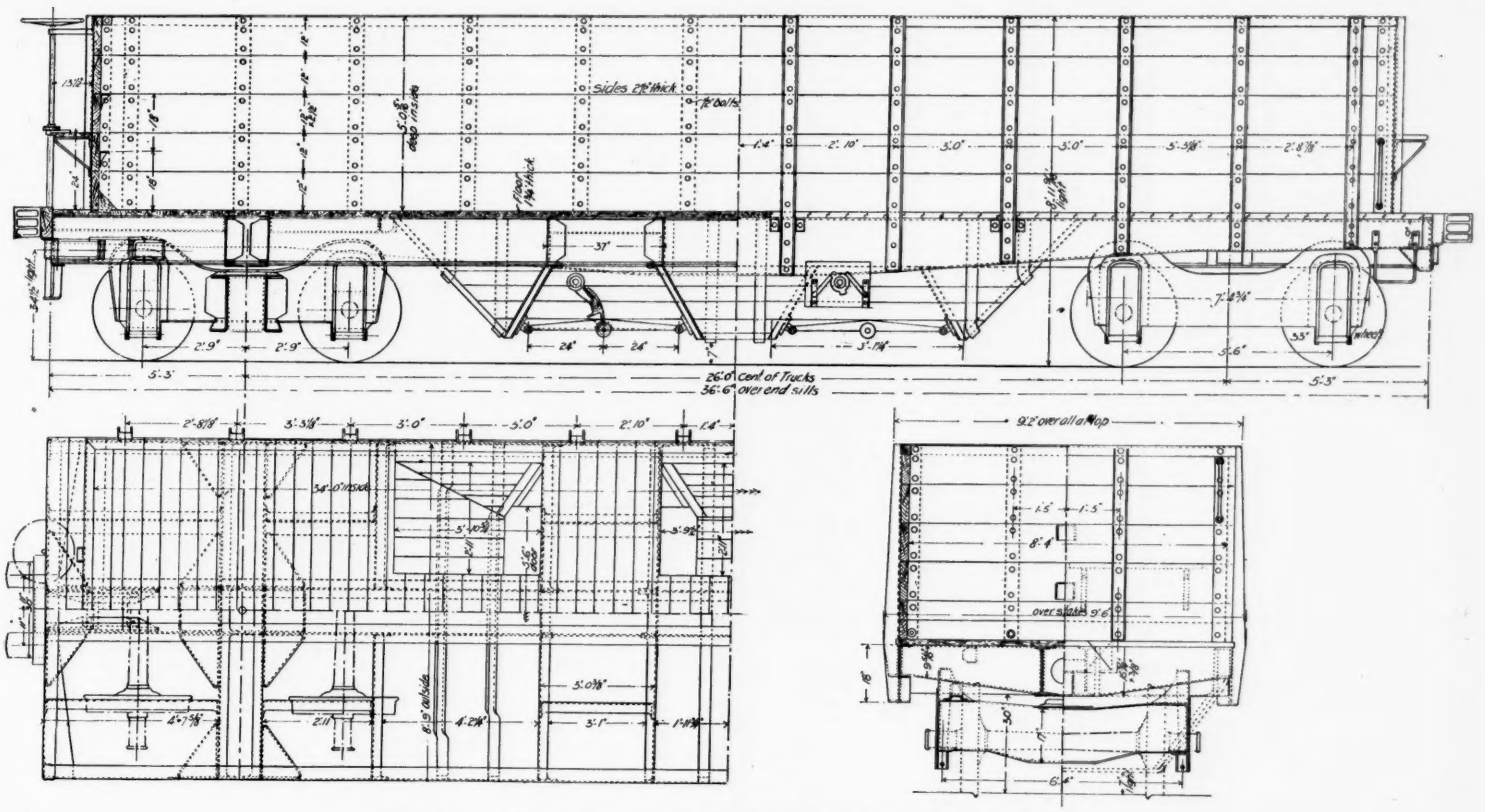
In conclusion, it may be again said that there is up to the present time no reason to believe that in obtaining greater safety durability is sacrificed; on the contrary, all of the evidence thus far obtainable goes to show that decreased durability is not to be expected; in fact, one of the most prominent manufacturers in the country is making wheels for special

purpose of obtaining toughness, and states his ability to prove even a higher mileage life.

This report is signed by Mr. S. P. Bush.

STEEL CAR FRAMING.

The report by this committee included drawings of many steel cars which we have heretofore illustrated in the Railroad Gazette. The plan for steel underframing by J. N. Barr, Mr. R. P. C. Sanderson's plan, and also the one presented by Mr. G. R. Joughins, were shown in our issue of June 11, 1897, in connection with the report of this committee at the Old Point Comfort convention. The Pennock and Schoen designs have also been illustrated in previous issues. We show herewith designs of the Fox double hopper bottom gondola car, and the Fox pressed steel freight car, both of 100,000 lbs. capacity; also half-plan and sections of the Harvey steel box car. The report, nearly in full, is as follows:



Double Hopper Bottom Gondola Car of 100,000 lbs. Capacity—Design by Mr. Fox.

Your committee has obtained blue prints of steel car frames of several designs which were not described in the report submitted last year, but all but two of the designs lack so many dimensions that calculations of their strength could not be made, and, furthermore, attempts made by the committee to obtain further information were unsuccessful.

The twelve members of the Association replied to the circular which the committee issued to elicit information. The members who replied to the circular represent 151,828 cars, or about 12.4 per cent. of the total number of cars represented by the Association. The number of cars represented by those who replied to the circular and by members of the committee is 208,389, or about 17 per cent. of the number of cars represented by the Association.

The replies received were as follows:

To question number one: "If you have had any steel car frames in use please describe all the important facts about them which your experience has brought forth, and furnish working drawings illustrating the same," six individuals and companies reported the results of their experience with steel cars.

To question number two: "Which do you consider preferable for the members of the car frames, rolled shapes of standard commercial sizes or special pressed shapes?" six replied that they preferred rolled shapes; one preferred pressed-steel shapes except for center sills, which he thinks should be I beams; and one replied as follows: "Would prefer pressed shapes for the following reasons: a. The various members can be made of uniform strength by placing the metal where it will be most useful; b. The parts can be made lighter in weight; c. Better connections for the various parts can be provided for."

To question number three: "Which do you prefer, a car frame made entirely of steel or a composite frame made of steel and wood?" seven replied that they preferred all steel, two preferred steel and wood and one preferred steel and malleable iron.

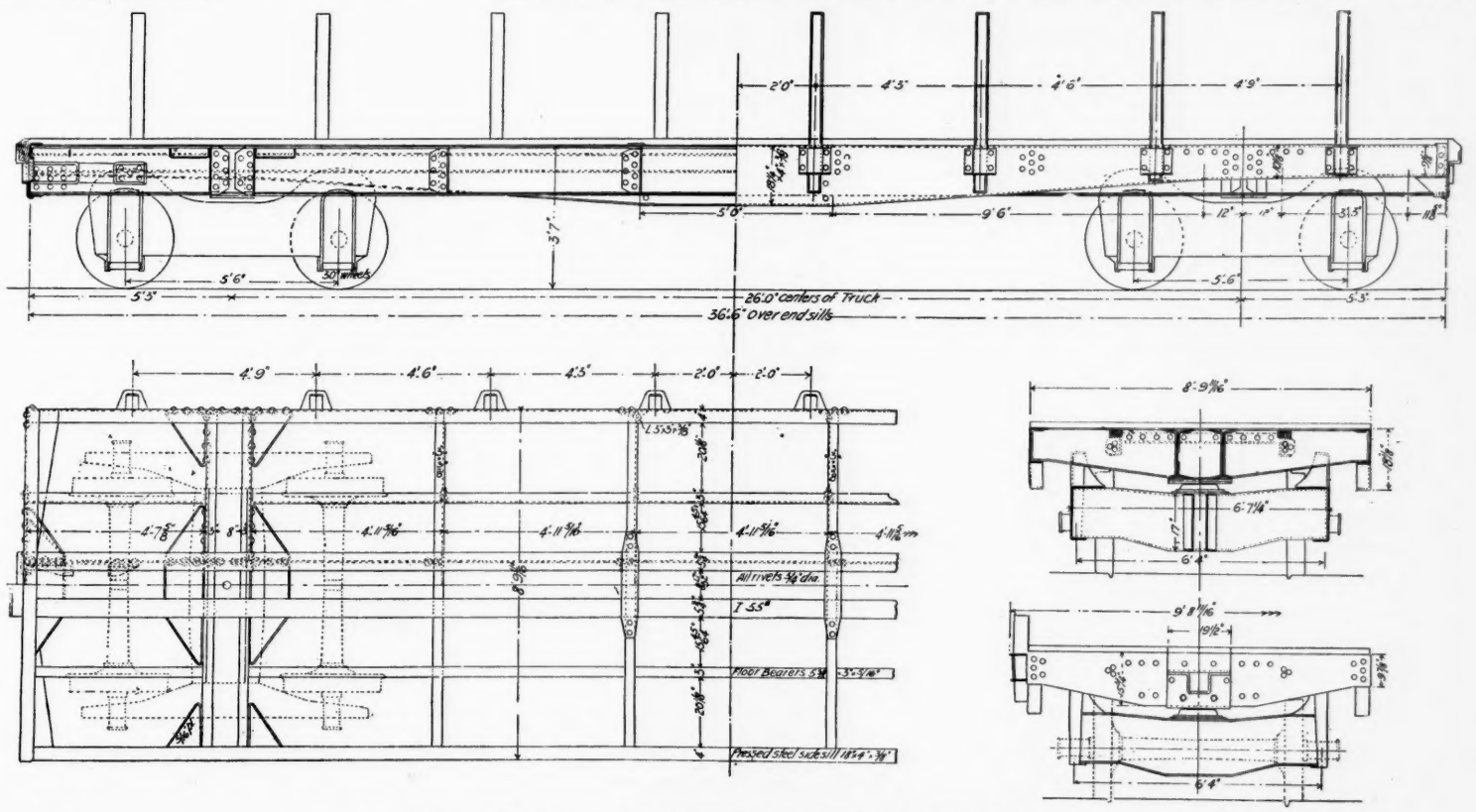
To question number four: "What parts do you recommend be made of wood?" one recommended that center sills only be made of steel; another replied that the end sill is the only part which it is allowable to make of wood; another recommended that the floor and the superstructure be made of wood in all cars except coal and flat; another recommended that the floor, sides and ends only be made of wood; another advises as follows: "Would recommend that any parts of car subjected to abrasion or which might be injured by the material to be carried or any covering for the purpose of protecting the load from the action of heat or cold be made of wood. Generally speaking, the covering of superstructure and floors, but not of necessity the framing of superstructure."

To question number five: "What is your opinion of the advisability of using truss rods underside sills of steel car frames? and give the reasons for your opinion," the replies were as follows: Seven recommended that no truss rods be used, one recommended truss rods to support the side sills, and one recommmended truss rods if by their use the car can be made lighter.

To question number six: "Do you recommend that the draft gear of steel car frames be located between center sills and firmly secured to them, or the use of independent draft timbers below the center sills, similar to the construction which is now generally used on wooden cars?" ten replied that the draft gear should be placed between center sills.

To question number seven: "Which do you recommend, wooden or steel side and end sills, and what are your reasons therefor?" nine replied that they favored the use of steel end sills, and one recommended wooden end sills.

To question number eight: "Please give maximum light weight of car, per ton (net 2,000 lbs.), you would recommend for each ton of paying freight?" 600, 700, and 800 lbs. are recommended. One member suggested 900 lbs. for coal cars only. In another reply



Pressed Steel Flat Car of 100,000 lbs. Capacity—Design by Mr. Fox.

666 lbs. is recommended for hopper cars to carry iron ore, and 800 lbs. for box cars.

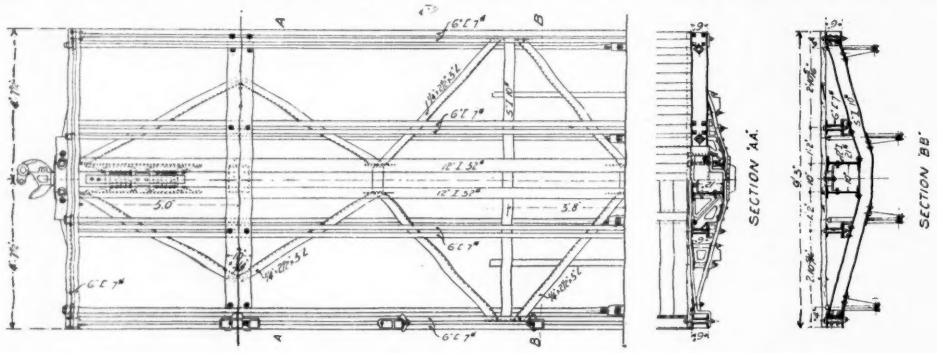
To question number nine: "Recognizing the fact that steel car framing will be used in cars of very large capacities, what type of center plate would you recommend, and what maximum bearing pressure, per square inch, would you recommend for carrying the car and lading?" three recommended the use of pressed steel center plates, and one recommended malleable iron. One member recommended that the bearing pressure shall not exceed 1,600 lbs. per square inch, and another 2,500 lbs. per square inch. One member thought that cars should not be center bearing, but that each of the side bearings should support as much of the load as the center plate.

To question number ten: "What type of side bearing would you recommend for cars of large capacities with steel car framing?" six recommended plain side bearings of pressed steel or malleable iron, and two recommended roller side bearings.

The members of your committee believe that at the present time it is impossible to design a steel car frame which will meet with universal favor. The extremely limited extent of the experience which has been obtained with steel cars up to date is alone a sufficient reason for recommending the postponement of the selection of a design at the present time.

Your committee recommends that it be discharged and that the steel car question be considered by another committee of this Association about four years hence.

The members of this committee are A. E. Mitchell, W. P. Appleyard and William Forsyth.



Underframing of Harvey Steel Box Car of 80,000 lbs. Capacity.

PASSENGER CAR PEDESTAL AND JOURNAL BOX FOR JOURNAL 4¼ × 8 IN.*

The Committee on Standards, to which was referred the recommendations embodied in the report of the Committee on Passenger Car Pedestal for axle with journals 4¼ in. x 8 in., begs leave to report that in its judgment the Committee on Pedestals ought to be continued, and to be merged into a committee, which, it is assumed, will be appointed on the recommendation already made by the Committee on Standards, to adopt the present standard journal box for use in trucks (whether passenger or freight) having pedestals; the committee so continued to be designated, however, as the Committee on Passenger Truck Pedestal, for axle with journal 4¼ in.x 8 in., and on journal box for use in trucks (whether passenger or freight) involving the use of the pedestal and axle with journal 4¼ in. x 8 in.

The committee respectfully reports as follows:

Owing to the wide variation existing between the ordinary Master Car Builders' pedestals now used in passenger equipment trucks and the various pedestals now used in freight trucks, the committee is of the opinion that it is absolutely impracticable to follow the recommendations of the committee on standards. To meet all objections raised to the wording of the Committee's recommendations in last year's report, it respectfully offers the following for consideration; being governed in a great measure by the replies received, the committee has no hesitation in recommending:

1. The adoption of a standard passenger car pedestal for 4¼ in. x 8 in. journals.* This pedestal has the same width and length of jaw inside as the present M. C. B. standard pedestal for 3¾ in. x 7 in. journal box shown on M. C. B. sheet 10, but it has a different design of top and a different location of bolt holes therein.

2. The adoption of a passenger car journal box for use with journals 4¼ in. x 8 in., with inside dimensions as shown herewith. These dimensions admit of the standard 4¼ in. x 8 in. journal bearing and key as used in freight journal boxes. This design, with these inside dimensions, has been in successful use for several years.

The members of this committee are Geo. W. West, T. B. Purves. Jr., and J. W. Marden.

*This pedestal was illustrated in the report of the committee last year, given in our issue June 11, 1897.

CARE OF JOURNAL BOXES.

In answer to Question 1, "Would you recommend a high or low grade oil?" A large majority of those who replied recommend a high grade oil; a few recommend a high grade for passenger, and low grade for freight.

The answers to Question 2. "What does it cost you per 1,000 miles for car lubrication?" vary all the way from ¼ pint of oil, costing 1 cent per 1,000 miles on passenger cars of eight boxes, to 15 cents for freight and 24 cents for passenger, the average being about as follows: For freight, 9 cents; for passenger, 16 cents. A number of roads gave replies combining the cost of passenger and freight lubrication per thousand miles, the average cost for those replies being about 9¾ cents.

To Question 4, "How much oil do you use per car, per 1,000 miles?" the replies indicate that the average amount on passenger and freight, combined, is about 4 pints per 1,000 miles for freight and 6 pints for passenger; while those reporting both passenger and freight give the average per 1,000 miles as 4¾ pints.

In reply to Question 5, "What is the average number of hot boxes per 1,000 miles?" the replies vary considerably, but the average number of hot boxes per 1,000 miles is 2½.

Regarding Question 6, "Do you prefer cotton or woolen waste, and why?" 75 per cent. of the members reply directly to the question, preferring woolen to cotton, and in almost every case say it is preferred because of its greatly increased elasticity, and that it feeds oil better than cotton. The large majority of those preferring cotton do so on account of its being cheaper than woolen. Several of the members who reply that they prefer woolen to cotton waste also prefer a waste known as asbestos packing, of first-class woolen waste and asbestos, which your committee understands to be a patented article.

In reply to Question 7, "Is there any other material, whether patented or not, that you would recommend instead of waste for packing, and why?" practically all replies were to the effect that they knew of nothing they would recommend as a substitute for waste.

To Question 8, "How long do you consider it necessary to soak waste before using, and at what temperature?" replies are unanimous in saying that the waste should be soaked from 24 to 48 hours.

In reply to Question 9, "What device, whether patented or not, do you prefer to prevent dust from entering rear of journal box?" the balance of the members, who are a large majority, prefer the ordinary wooden dust guard as the most practical, although some of them say they never saw any that were dustproof.

Regarding Question 10, viz.: "What journal-lid box, whether patented or not, do you prefer, that would prevent leakage of oil and at the same time be dustproof?" Four members prefer the McCord, and ten the Fletcher, the rest being scattered, and in such a way as to make it impractical for the committee to describe them.

In answer to Question 11, viz.: "What particular method, if any, have you in arranging the packing in the journal boxes?" This question has been receiving considerable attention. Mr. Waitt replies by sending copy of instructions issued to car men, and Mr. N. L. Smitham, of the Texas Midland, also sends copy of instructions, both of which are embodied:

All journal boxes under Lake Shore passenger equipment cars will be repacked with waste saturated with winter oil, beginning the work each year on the 1st day of November. All good, clean waste removed from boxes will be used in this repacking, after having had the summer oil thoroughly squeezed out by pressure, and resaturated with the winter oil. In addition to the above repacking, all cars will be repacked six months afterward; the waste to be removed and all good, clean waste resoaked in summer oil. In this repacking, the waste removed need not have the oil squeezed out. In repacking boxes, new waste should not be used alone, but should (where it is practicable) be mixed with the old, the two to be mixed in the proportion of half old and half new. When boxes are repacked, tin tags 1 in. by 3½ in., having station abbreviation with month and year stamped thereon, will be attached to two opposite corners of each truck frame.

All through passenger trains on the main line will be oiled at Buffalo and Chicago only, and no oiling at intermediate points will be done, except in case of a warm or hot box, or other emergency. All local and branch passenger trains and cars not running in main line service between Buffalo and Chicago are to be oiled once in every 2,000 miles run, the date of oiling of all cars in such trains to be marked in chalk on underside of side sill over each truck, giving month and day of month. In each case of cars which have no regular run, inspectors will be expected to use their judgment in seeing that the cars are given sufficient oiling when at their stations, care being taken to avoid using oil unnecessarily. Division master car builders will assign the terminals at which the regular oiling of cars in local and branch trains will be done.

All Lake Shore freight equipment cars which are placed on shop repair tracks are to have the waste removed from boxes and boxes repacked. All waste removed that is good for further use to be resoaked in saturated waste tank for 48 hours, and used in again repacking boxes under such cars. This same practice should be carried out at inspection points to as great an extent as possible, consistent with surrounding conditions.

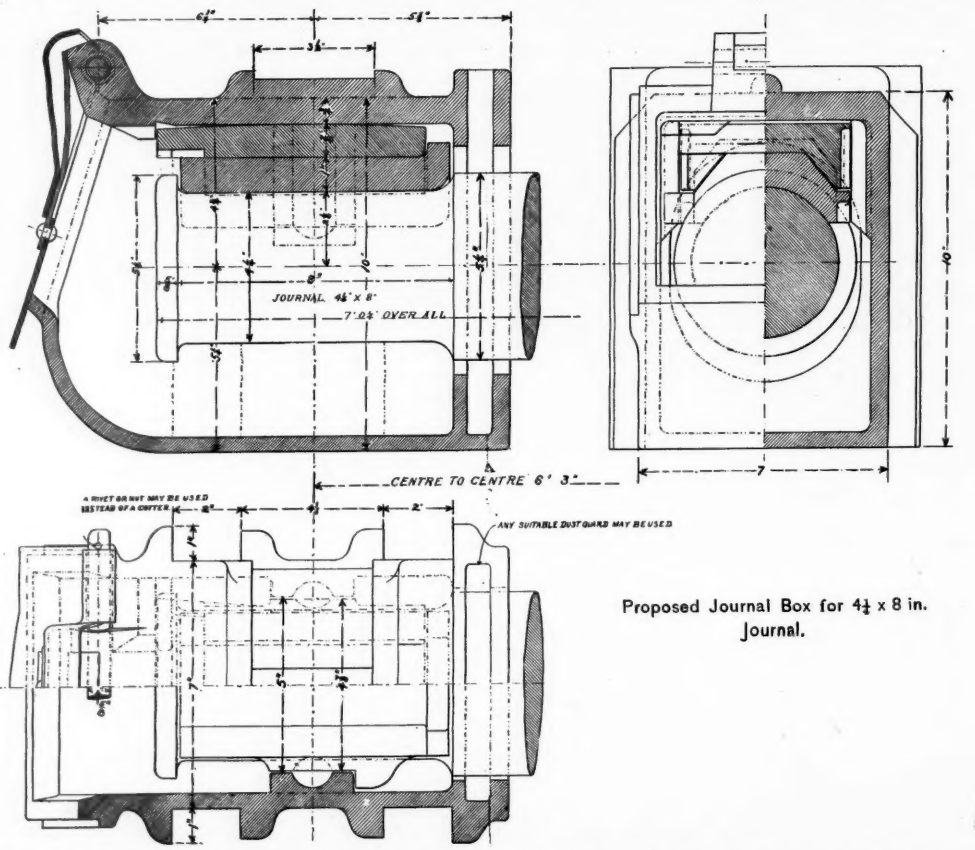
All cars received from connections at interchange points, also all cars set out of trains at stations where inspectors are located, and all foreign cars placed on shop repair tracks are to have the lids of journal boxes opened and the packing put in proper condition to run without question over the road, using well-saturated waste for the purpose. The use of an oil can at stations other than East Buffalo and Chicago will not be permitted. In addition to putting waste in good condition, examination must be made to see that journal, journal bearings and keys are in proper condition.

Caboose car boxes will be taken care of by the use of saturated waste in the same manner as other freight car boxes. They should be examined after each trip, and when in need of oil, saturated waste should be applied.

All through freight trains on the main line are to be oiled at Buffalo and Chicago only, and no oiling will be done at any of the other points under any circumstances. Where it is necessary to put a box in good condition, either by reason of a hot or warm box, lack of oil or waste, it should be done by using the saturated waste. In the treatment of boxes having a sufficient quantity of packing, but which are in need of oil, a small amount of the packing should be removed to give place to the saturated waste which is to be applied, care being taken to apply the saturated waste so that it will come in contact with the journal where it will do the most good.

In the packing of boxes the first portion of waste applied should be packed moderately tight at the rear end of box. Care should be taken to keep the waste at the sides of box down below the brass about an inch, and also to have that portion of the waste forward of the journal separate and distinct from that which extends from front end of journal to the back of the box. This will avoid the disarrangement of the packing at rear of box. The roll which is placed in front of box to not extend above the lower edge of opening of box.

This report is signed by J. T. Chamberlain, J. J. Hennessey and R. H. Johnson.



Proposed Journal Box for 4¼ x 8 in. Journal.

SPECIFICATIONS FOR AIR BRAKE HOSE.

The report on this subject was written by Mr. A. M. Waitt and covers 20 pages with two folding plates of drawings. Mr. Waitt goes into his subject with great thoroughness, describing minutely the process of making air brake hose. He says that the general impression that one great requisite is strength to resist bursting is wrong. Many experiments show that many of the poorest grades of hose will stand far greater bursting pressure than hose known to be of much better quality. He thinks that 500 lbs. would be a sufficient bursting strain for testing. The specifications for air brake hose used on the Lake Shore & Michigan Southern are given in full. These require hose not less than two-ply nor more than three-ply. The hose must be hand made, the canvas of long-fiber cotton, loosely woven, to weigh not less than 22 oz. per yard and to be from 38 to 40 in. wide. The

tube must be of high quality rubber not less than $\frac{1}{32}$ in. thick. The cover must be of the same quality of gum as the tube and not less than $\frac{1}{16}$ in. thick. A friction test and a stretching test are specified and machines for making these tests are shown in the drawings.

By a study of the scrap pile the principal causes of removal of hose are found to be: Rubber of cover badly cracked at kink and hose porous or leaky near the fittings. It is found that in many cases the tube has been torn or cut by carelessness in applying the fittings or by rough fittings. Sometimes the hose is porous all over. Sometimes the rubber seems to have lost all its life and become brittle; third, chafed or cut by chafing. This is quite common and comes from hitting or rubbing, generally at the nipple fitting end. To avoid these and kindred defects hose must be soft and pliable, and four-ply hose can only with difficulty be made sufficiently pliable. In ordinary wrapped hose the rubber courses and the canvas wrappings do not work in harmony when subjected to bending. This harmony can be secured by proper construction referred to as the tubular construction. The quality of rubber used is one of the most important features. The longest lived air hose is made of rubber that can be stretched 400 per cent. without breaking. It must also within 10 minutes after release return to within ¼ of an inch of its original length. A set of recommended specifications of eight paragraphs, including bursting, friction and stretching tests, is submitted.

SPRINGS FOR FREIGHT CAR TRUCKS.

The chief aim of the committee has been to submit such designs as are practical and economical, in order that, in case of adoption, they may not become a dead letter, but serve the purpose for which they were designed. Standard springs, to be desirable, must be so designed as to best satisfy the following conditions:

1. The springs must be generally applicable to the majority of the existing cars without expensive alterations in their application.
2. They must be so designed that they will not increase the cost of maintenance by premature failure or excessive first cost.
3. There should be a minimum number of different coils, and the different coils should be so made as to be readily distinguished one from the other, so as to prevent confusion and mistakes in application, and to reduce the cost of stock necessary to be carried for prompt repairs to both foreign and individual cars of usual design.
4. All coils used for outside bars to be wound right-handed, and the inner coils to be wound left-handed, to prevent interlocking.

In the designing of these springs, it has not been considered necessary to consider cars of less capacity than 40,000 lbs., nor does there seem to be occasion to consider a spring for pedestal trucks for cars of less than 50,000 lbs. capacity, as such cars are few in number, and are not likely to be perpetuated. The fact that there is no M. C. B. standard journal box for 90,000 or 100,000 lbs. capacity cars, debars the consideration of springs for cars over 80,000 pounds capacity for the present. These can be considered in time to come, when more of these cars are in existence, and some standard journal box is adopted. It was considered desirable that the springs and plates for use with the cars at 40,000 lbs. capacity should be available for use under 50,000 and 60,000 lbs. capacity cars, so that there will be no loss at such time as the 40,000 lbs. cars cease to exist.

Graduated springs, or springs made of other than round bars, have not been considered, and as the elastic limit per square inch is greater for smaller bars than the larger, it is objectionable to use larger sections than are absolutely necessary. Also as spring coils, and not the spring plates, are the expensive articles and those that break, it is not desirable to sacrifice the designs of the springs for the sake of limiting the cost and number of patterns for spring plates, and it is considered preferable to buy the springs by the coil, and the plates separately, not to be put up in sets. Since it has been found upon investigation that the pressed-steel plates are slightly cheaper than malleable iron, plates of designs suitable for pressed steel only have been suubmitted. Moreover, the use of both pressed-steel and malleable iron plates means two separate sets of springs, as, owing to the difference in thickness of the pressed-steel and malleable iron (about ¼ in. for a pair of plates), the springs used with steel plates would have to be ¼ in. higher than those used with the malleable iron, to give the same free heights over spring plates. It has further been decided that the use of bolts for securing the top and bottom plates are not only superfluous, but a source of danger, in that these bolts get in between the coils and springs, and cause the destruction of the springs, and also are a source of expense in the first cost of the spring plates, as the provision for such bolts adds to the cost.

In the designing of the springs themselves, the best practice has been followed in all cases, and spring makers consulted.

Your committee therefore recommends for adoption as standards the following coils, drawings of which are submitted. The combinations in which these coils can be used appear in the schedule.

Spring A.—5 in. diameter, $\frac{5}{16}$ in. diameter steel, 5⅞ in. free height; to carry 3,500 lbs. at 5 in.; weight 10¾ lbs.

Spring B.—3$\frac{1}{16}$ in. diameter, $\frac{9}{16}$ in. diameter steel, 5⅞ in. free height; to carry 1,150 lbs. at 5 in.; weight, 4 lbs.

Spring C.—7 in. diameter, 1$\frac{5}{16}$ in. diameter steel, 7 in. free height; to carry 8,000 lbs. at 6 in.; weight 24½ lbs.

Spring D.—4¼ in. diameter, ⅞ in. diameter steel, 7 in. free height; to carry 4,500 lbs. at 6 in.; weight 9½ lbs.

Spring E.—7½ in. diameter, 1⅜ in. diameter steel, 7½ in. free height; to carry 11,000 lbs. at 6½ in.; weight 32 lbs.

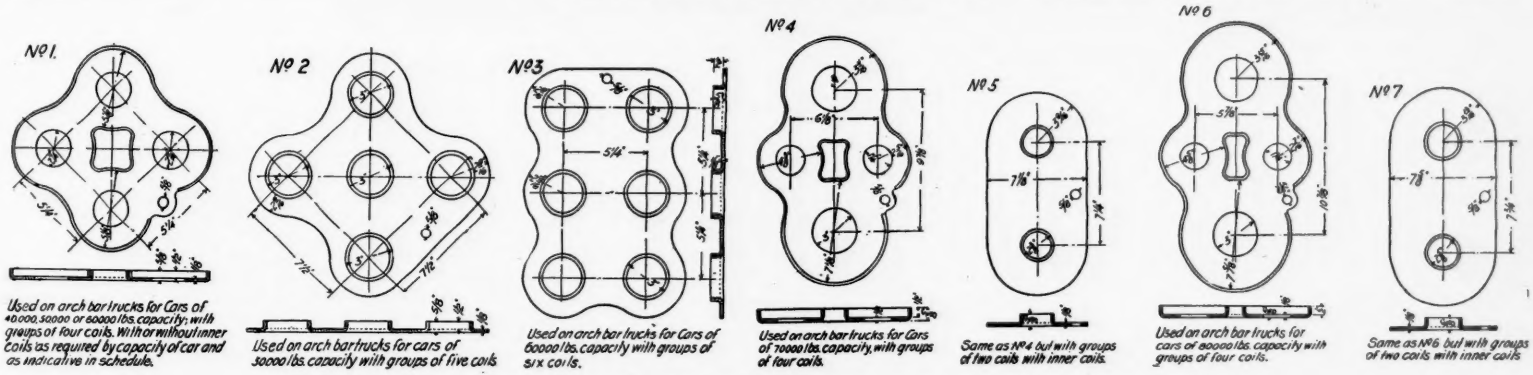
Spring E.—4½ in. diameter, ⅞ in. diameter steel, 7½ in. free height; to carry 5,000 lbs. at 6½ in.; weight 12½ lbs.

By reference to the column headed "Arch Bar Trucks," in the schedule submitted, it will be seen that the carrying capacities of the groups recommended increase by fairly regular graduations. To enable the recommended standard coils to be most generally and economically useful, such groups can be selected and used as come nearest in capacity to the actual load to be carried, without reference to the marked carrying capacity of the car. Thus a heavy refrigerator car of 50,000 lbs. capacity and a flat car of 70,000 lbs. capacity may use the same combination of springs, on account of the great difference in light weight of the bodies.

If this plan is followed, the committee would recommend that the number and class letter of the coils to be used in each truck should be stenciled on the truck to prevent mistakes being made by repairmen.

To meet the greatest possible variety of conditions, drawings for spring caps are submitted, showing caps for springs C and D or E and F, to be used in groups of four, or in groups of two, the smaller coils being placed inside the larger ones. Your committee recommends that the springs and caps submitted, and the schedule for their use be adopted.

The members of this committee are John S. Lentz, A. G. Steinbrenner, R. P. C. Sanderson and F. W. Brazier.



Designs of Standard Spring Caps for Freight Car Trucks—Recommended by the M. C. B. Committee.

Schedule for the Use of Recommended Standard Springs.

Capacity of car. Lbs.	Arch-bar trucks—Per group.					Pedestal trucks—Per box.			
	No. of coils.	Capacity. Lbs.	At.	Weight. Lbs.	Cap.	No. of coils.	Capacity. Lbs.	At.	Weight. Lbs.
			In.					In.	
40,000	4 of A	14,000	5¼	43	No. 1	.....	.....	....	....
50,000	4 of A 2 of B	16,300	5¼	51	No. 1	1 of C	8,000	6	24½
	5 of A	17,500	5¼	53¾	No. 2	.....	.....	....	....
60,000	4 of A 4 of B	18,600	5¼	59	No. 1	1 of C 1 of D	12,500	6	34
	6 of A	21,000	5¼	64½	No. 3	.....	.....	....	....
70,000	2 of C 2 of D	25,000	6¼	68	No. 4 or No. 5	1 of E 1 of F	16,000	6¼	44½
80,000	2 of E 2 of F	32,000	6¾	89	No. 6 or No. 7	1 of E 1 of F	17,000	6¼	44½

Note—Heights given in above include spring caps for arch-bar trucks. Number and class letter of springs used to be stenciled on the trucks of cars.

RUST FROM SALT-WATER DRIPPINGS.

Replies to the circular of inquiry sent out on Nov. 22, 1897, have been received from railroads that handle about 55,000 refrigerator cars loaded with dressed beef per year.

The committee started out with the idea of having refrigerator cars fitted with one or more reservoirs to be attached underneath the car body into which the salt water drippings could be conveyed, the reservoirs to be large enough so that they would not have to be emptied more than once every twelve hours, at division terminals, where proper provision could be made for taking care of the salt water. This idea, however, met with so much opposition on the part of the refrigerator car owners, that the committee abandoned it, not caring to recommend an arrangement that the refrigerator car owners would be unwilling to adopt.

The committee presents two methods that can be followed without much expense, either one of which will improve the present condition of affairs; and although a patent has been applied for in the case of Design No. 2,† it is the opinion of the committee that this design will give the better results. Design No. 2 will be the more expensive, but will not cost to exceed $5 per car, including royalty, if the patent is granted. The principle of both designs is to convey the salt water so that it will drop between the rails, at about the center of the track, where it will do little or no damage.

In fitting up a refrigerator car with either type of attachment, care should be taken to provide caps or plugs at proper points; so that the pipes can be readily cleaned out, and galvanized iron piping should be used, in order to resist the corroding action of the salt water or brine in passing through it.

The members of this committee are S. Higgins and A. M. Waitt.

†This design was well shown in our issue of April 22 last, in the description of the Wickes refrigerator cars.

Railroad Legislation in Ohio.

The Legislature of Ohio, which has recently adjourned, passed ten general laws affecting railroad and transportation interests.

House bill No. 262, amending Section 6,951 of the Revised Statutes, prohibiting cruelty to animals, has a clause requiring live stock carried in railroad cars to be fed, watered or attended to, as may be necessary, at least once every 24 hours. The penalty is from $5 to $200 or imprisonment not more than 60 days, or both fine and imprisonment. The law is so worded as to apply to stock which has been confined 24 hours, whether the same was loaded within or without the State, and, as this is a police protection, it would seem to have the effect of shortening the time (28 hours) allowed under the federal statute for transporting animals without feed or rest.

Senate bill No. 49 amends the free bicycle law of 1896. Bicycles with or without lanterns or tool boxes must be treated as baggage, and no passenger shall be required to crate or cover a bicycle.

House bill No. 75 requires every steam railroad carrying freight or passengers ten miles or more to maintain a telegraph or telephone line with an office at each of its principal stations. A road not complying with this requirement may not lawfully accept compensation for carrying passengers or freight; its charter may be declared forfeited, and any person accepting pay for carrying passengers or freight shall be fined from $100 to $500, or imprisonment from 30 days to 90 days.

Senate bill No. 482 authorizes street railroad companies to buy or lease the property and franchises of electric light and power companies. Suitable provision is made for the assent of stockholders and the protection of dissenting stockholders.

Senate bill No. 336 is an anti-trust law. The definition of "trust" includes any combination to prevent competition in transportation of merchandise, produce or any commodity. This act takes effect July 1.

House bill 712 declares forfeited the right of way of an unfinished railroad which has remained unimproved for ten years. There is a proviso excepting companies which have laid 20 miles of track or have expended $1,000 a mile.

Senate bill No. 25 amends Section 2,505a (April 22, 1896). Any company organized for street railway purposes may lease or purchase any street railroad, subject to approval, under suitable regulations, by the stockholders. Fares must not be increased under a lease or purchase, and the fare charged for one continuous ride in the same general direction over all such leased or purchased lines within any municipal corporation must not exceed the fare charged over any one of said lines before the change.

House bill No. 199 gives until Jan. 1, 1900, for the equipment of cars with automatic couplers. By the date named all cars must have automatic couplers, and all passenger cars and 30 per cent. of freight cars must have air brakes. After the date named no freight train shall be run without 25 per cent. of the cars air braked. One-fourth of the couplers and brakes required by this law must be put on before Jan. 1, 1899.

House bill 416 amends the interlocking law of April 27, 1896. Section 3 is made to read so that a railroad company or an electric railroad company seeking to cross the line of a railroad company must provide safety appliances, to the satisfaction of the Commissioner, at its own expense. The maintenance and operation of the plant is to be borne by all the companies interested in shares to be apportioned by the State Railroad Commissioner.

Senate bill 467 requires the angles, of all frogs switches and crossings, in yards, divisional and terminal stations, to be blocked by June 1, 1899; "the best known sheet steel spring guard or wrought iron appliance" is to be used, and it must be approved by the Commissioner of Railroads.

The bill requiring a certain number of brakemen on trains was indefinitely postponed.

Locomotive Road Tests—Illinois Central Railroad.

Through the courtesy of Mr. William Renshaw, Superintendent of Machinery, and other officers of the Illinois Central, opportunity has recently been given to the students of the Mechanical Engineering Department of the University of Illinois to take up various investigations of the operation of the locomotives of that road. The investigation requiring the most work was carried on under the direction of Prof. L. P. Breckenridge during the spring term of 1897, three types of locomotives being equipped by the company, and tested by the Seniors and Juniors of the Mechanical Engineering Department. The principal dimensions of these engines are as follows:

Number	409	623	962
Type	Ten-wheel. Freight	Ten-wheel. Freight.	Eight-wheel Passenger.
Weight on drivers, lbs	106,400	118,600	80,000
Weight on truck wheels, lbs.	19,600	18,700	40,000
Weight, total, lbs.	126,000	137,300	120,000
Heating surface fire-box, sq. ft.	173.08	207.45	192
Heating surface, tubes, sq. ft.	1,358.57	1,357.9	1,649
Heating surface, total, sq. ft.	1,531.65	1,565.35	1,801
Grate area, sq. ft.	26.45	28	27.4
Drivers, diameter, in.	54	54	75
Cylinders, diameter, in.	19	21	18
Piston stroke, in.	26	24	26
Piston rod diameter, in.	3½	3¾	3½
Boiler type	Bellpaire.	Bellpaire.	Bellpaire.
Boiler working steam pressure, lbs. per sq. in.	165	165	200
Boiler, outside diameter of barrel, in.	62	62	62

All the records of these tests have not been completely worked up, but the principal general results of all the tests are known. Some of the methods and apparatus used are original, and, as they were found to work satisfactorily, a full description of these is given. The object of the tests was to determine the character of the steam distribution, the horse-power developed by the engine, and the coal and water consumption. To obtain these results, the following observations were taken:

1. Number of train.
2. Number and length of stops.
3. Speed of engine in miles per hour, and in revolution of drivers per minute.
4. Time of passing mile posts.
5. Indicator cards from each of the cylinders.
6. Indicator cards from the steam chest.
7. Position of the throttle valve.
8. Position of the reversing lever.
9. Boiler pressure.
10. Weight of coal used.
11. Weight of water used.
12. Temperature of feed water.
13. Draft in smokebox.
14. Temperature of escaping gases.
15. Tonnage hauled.
16. Distance run.

Indicator Cards.

The apparatus necessary for taking diagrams consisted of pipe connections with a three-way cock for the attachment of the indicators and some form of reducing motion.

The system of piping used on Engine 409 consisted of two horizontal branch pipes connected to a three-way cock near the middle and below the steam chest; these pipes were ¾ in. in diameter. This arrangement gave very satisfactory results, so far as the diagrams were concerned; but it brought the indicator so low on the side of the steam chest that it was inconvenient to handle.

On Engines Nos. 623 and 962 this difficulty was overcome by extending the piping up a few inches, as shown in Fig. 1. Three-quarter inch pipes were used for this purpose. The slight increase in the length of the pipe had no appreciable effect on the diagram, while it placed the indicator in a position in which it could readily be handled. Short turns were avoided by bending the pipes, and all connections were made solid, so that it was impossible for the indicator to have any longitudinal or transverse motion. All pipes were securely covered with asbestos to prevent losses due to radiation.

The from of reducing motion used on Engines No. 409 and 623 consisted of a pantograph, as shown by Fig. 2. The motion was communicated to the indicator by means of a rod, which was guided by brackets attached to the side of the cylinder. The links were made of 1-in.x¼-in. iron, with the joints enlarged to ½-in. thickness, excepting at the point of attachment to the cross-head and at the fixed point, at which places the joints were made 1½-in. long. The object of the enlarged joints was to obtain a large bearing surface to withstand the wear and to add to the stiffness of the mechanism.

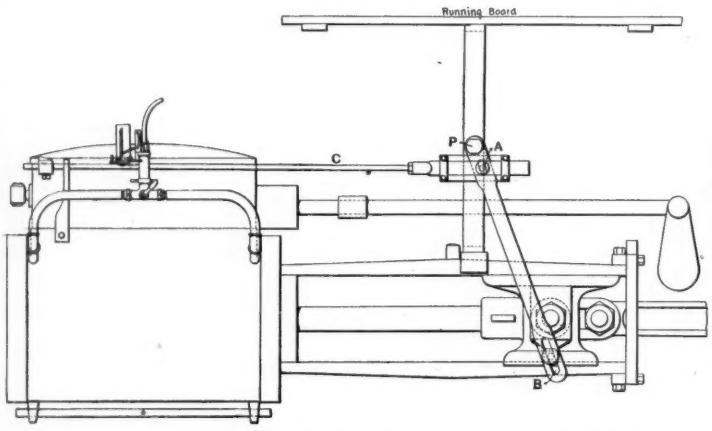


Fig. 1.—Indicator Rigging for Passenger Engines.

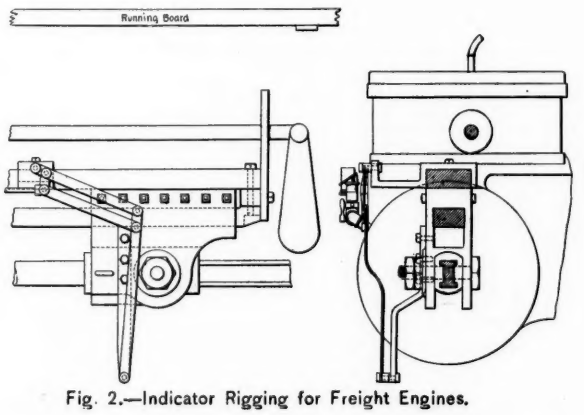


Fig. 2.—Indicator Rigging for Freight Engines.

Owing to the position of the center of gravity of the rig, and also on account of the vibrations of the engines, it was found that there was a great tendency for the pantograph to swing sidewise, thus putting a severe strain on the upper and lower links. This was especially noticeable when running at high speeds.

After having had the experience with the pantograph on the freight engines, it was decided to adopt a double-slotted lever reducing motion for the passenger engine. This is shown in Fig. 1. It is connected with the cross-head by a pin which works in the slot B. The motion is communicated to the indicator by the rod C, which is operated by means of a pin fitted into the slot A. The motion of this rod is constrained by a bracket attached to the bar that holds the fixed point, and also by a bracket attached to the side of the cylinder. The lever was made of ½ x2½-in. iron, with the ends enlarged to obtain more bearing surface. This form of reducing motion is very simple, and gave better satisfaction than the pantograph. Both reducing motions were so adjusted that the length of the diagram was one-tenth the length of the stroke of the engine piston.

The diagrams were taken on metallic cards, and the impressions were made with brass points. These gave very satisfactory results, although much care was necessary to keep the pressure sufficient to make a heavy impression while taking the diagrams. Crosby indicators were used on the freight engines, and Tabor indicators on the passenger engines.

During the first tests, when possible, diagrams were taken every minute while running. In an eight-hour test, if only one pair of diagrams were taken on a card a large number of cards would be required,

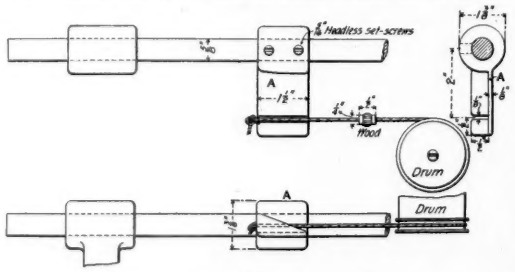


Fig. 3.—Indicator Drum Connection

so four pairs of diagrams were taken on each card. This was accomplished by having the connection of the indicator with the reducing motion arranged as shown in Fig. 3. The indicator drum was started by dropping its string into the slot in the reciprocating block A, and letting a knot in the cord pull the drum along. This proved to be a very satisfactory method of hooking up the indicator. On the string were also wooden beads ½ in. long, and, in order to take a second pair of diagrams, one of the beads was placed between the knot and the block A. This caused the drum to rotate through a different angle, and thus a diagram one-half inch further along on the card was taken. To take a third and a fourth pair of diagrams on the same card the second and third beads were likewise placed in turn between the knot and the block. The diagrams were short enough to allow for these four adjustments without the drum hitting the stops. Fig. 4 shows such a card.

Under some conditions, however, with four sets of diagrams on a card, it was difficult to distinguish the different back pressure lines. So, during most of the tests, only two sets were taken on a card, the distance between them being one inch. The interval between taking the diagrams was also increased to two minutes. As soon as a card was taken from the indicator, the time was marked opposite each diagram. Diagrams were also taken from the steam chest, the indicator being attached to the relief valve connections. Steam chest cards were taken only at intervals of from 10 to 20 minutes.

Speeds.

The speed of the engine was obtained by a Boyer speed recorder, at the front end of the locomotive and belted to a pulley on the front truck axle. The recorder gave the speed in miles per hour, and from this the number of revolutions per minute of the drivers was easily calculated. A revolution counter was attached to the reducing motion, and served as a check on the speed recorder. Observations were made every minute, and the records kept on a special blank, the time of passing mile posts served also as a check on the speed recorder. Little use,

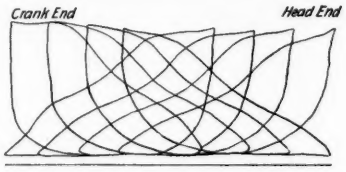


Fig. 4.—Sample Indicator Diagram.

however, was made of these readings, except to show the position on the roadbed.

Throttle-Valve and Reversing Lever.

The position of the throttle-valve and reversing lever was indicated by means of marked quadrants, connected close to each of the levers. Observations were made every time the indicator cards were taken and the records kept on a separate blank. The time of opening and closing the throttle-valve was also noted, so that at the end of the test, the length of time the engine had been using steam could be figured.

Water.

The weight of the water used was obtained by measuring the depth of the water in the tank. Previous to the tests the tanks were calibrated, and the results tabulated, so that by referring to the table the weight for every inch of water in the tank could be ascertained. The depth was measured at the rear on one side of the tender, and at the front end on the other, and the mean of the two readings was taken as the depth of the water in the tank. On engine No. 409, these readings were taken by means of a glass gage connected to the bottom and top of the tank. The glass was protected by means of a slotted iron pipe, and the scale from which the readings were taken was marked on this pipe.

On engines Nos. 623 and 962 a scale was screwed to the side of the tank, and the height of water was shown by means of a hose, leading from a valve in the bottom of the tank. The hose had a glass tube about 6 in. long at its free end, which could be held against the scale at any height desired. When the valve was opened, the hose was lowered until the water appeared in the glass, at which time a reading was taken.

A scale on the boiler of the locomotive showed the height of water within. This reading, as well as that of the boiler pressure, was always made the same at the end as at the beginning of the test.

Coal.

The weight of coal used was obtained by weighing the tender at the beginning and end of the test, al-

lowing, of course, for the difference in the weight of water in the tank at the two weighings.

Draft.

The amount of draft was read in inches of water by means of a glass U-tube connected to the smoke box. The glass was protected by a slotted iron pipe. On one of the legs was placed a scale, so that the difference in level of the water could be read.

Temperature.

The temperature of the escaping gases was also taken from the smoke box. It was obtained by fastening different metals, whose melting points were known, to a rod extending into the center of the box, and observing which ones melted.

Observers.

Six men were taken on each trip. Two were stationed in the cab and four at the front end of the engine. One of the men stationed in the cab recorded the boiler pressure, the position of the throttle-valve and the position of the reversing lever; while the other recorded the time of passing mile posts, and gave the signals for taking readings. Two of the men at the front end operated the indicators, the third recorded the speed, and the fourth recorded the draft pressures and the temperatures of escaping gases, and announced the time.

For the protection of the men stationed at the front of the engine, a small room was built. The floor of this room was on a level with the top of the cylinder, so that in case a cylinder head broke there would be less danger of personal injury.

Large electric bells were used in signaling, and the time was announced in minutes by a large sign on the front end, which could be read from any part of the locomotive.

Tests.

Twenty tests were made; eight on freight engine No. 409, between Champaign and Centralia; six on freight engine No. 623, betweeen Champaign and Centralia, and six on passenger engine No. 962, between Champaign and Chicago.

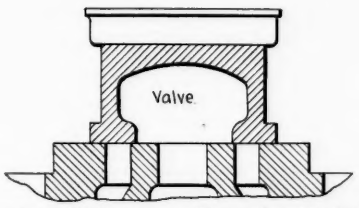
Table1 gives a summary of the general results of all the tests. It seems probable that an error was made in weighing either the coal or water used during the test of engine No. 409, on May 21, and also in the test of engine No. 623, on May 29, as the evaporation of water per pound of coal for these tests is considerably higher than the average of the other tests.

The results of the tests on engine No. 962 would indicate that the coal taken on at Champaign was much better than that taken at Chicago, at least the evaporation of water per pound of coal going north is much greater than when going south.

The vacuum of the smoke box of these engines when in motion varied from 4 to 12 inches of water, the average being about 8 inches. The temperature in the smoke box ranged from 800 to 1200 degr. F.

Figs. 5, 6 and 7 are sample diagrams obtained from the cylinders of the three engines, and show the steam distribution. The conditions under which they were taken accompany each diagram. The cards show remarkable care in valve setting, and also careful design in regard to link suspension and adjustment.

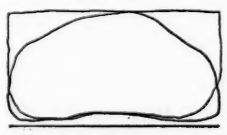
Fig. 8 shows the profile and graphical diagram of the test of engine No. 409 on May 15. An idea of the amount of work necessary to calculate one of



Dimensions of Valve.
Outside lap.. .....1⅜ ins.
Inside lap .....⅛ "
Throw of eccentric..5½ "

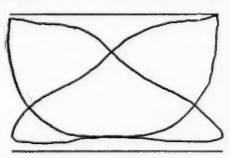
Dimensions of Valve Seat.
Width of steam ports ...1⅜ ins.
Width of exhaust ports..3 "
Width of bridge.....1¼ "

LEFT SIDE.



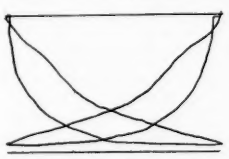
Miles per hour....4.

	Crank End	Head End
Init'l cyl. press..	136	137
M. E. P.....	114.2	111.8
I. H. P.....	53.6	53.8



Miles per hour.... 16
Boiler pressure...165

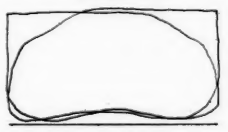
	Crank End	Head End
Init'l cyl. press..	160	162
M. E. P.....	87	84.5
I. H. P.....	148 5	149.6



Miles per hour.... 37
Boiler pressure .165

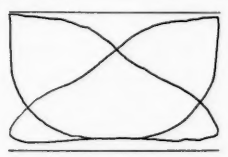
	Crank End	Head End
Init'l cyl. press..	160	160
M. E. P.....	36	33
I. H. P.....	146	139

RIGHT SIDE.



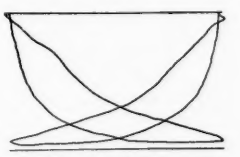
Miles per hour .. 4.

	Crank End	Head End
Init'l cyl. press..	134	136
M. E. P.....	113.4	113
I. H. P.....	53.2	54



Miles per hour.... 16
Boiler pressure .165

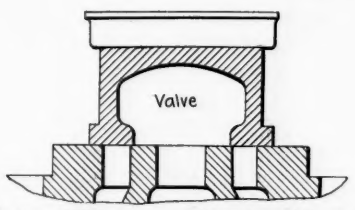
	Crank End	Head End
Init'l cyl. press...	162	160
M. E. P.....	94.6	90
I. H. P.....	162	159



Miles per hour . 37
Boiler pressure...165

	Crank End	Head End
Init'l cyl. press...	160	158
M. E. P	38	35
I. H. P.....	155	147

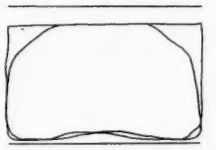
Fig 5.—Cards Showing Steam Distribution of Freight Engine No. 409.



Dimensions of Valve.
Outside lap ..... ⅛ ins.
Inside lap ..... ⅛ "
Throw of eccentric..5½ "

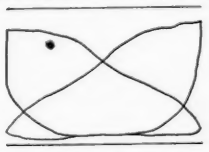
Dimensions of Valve Seat.
Width of steam ports ...1¼ ins.
Width of exhaust ports..2½ "
Width of bridge... .....1¼ "

LEFT SIDE.



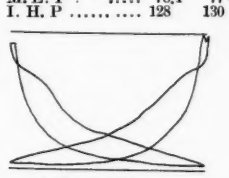
Miles per hour.... 3
Boiler pressure....165

	Crank End.	Head End.
Init'l cyl. press..	140	142
M. E. P	126	126
I. H. P.....	46.3	47.6



Miles per hour.... 13
Boiler pressure... 165

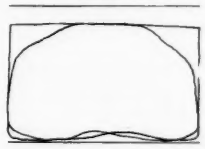
	Crank End.	Head End.
Init'l cyl. press..	138	142
M. E. P	78.4	77 6
I. H. P	128	130



Miles per hour.... 32
Boiler pressure....165

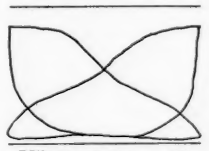
	Crank End.	Head End.
Init'l cyl. press..	130	130
M. E. P	29.2	27.5
I. H. P.....	119	115.5

RIGHT SIDE.



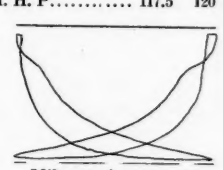
Miles per hour 3
Boiler pressure....165

	Crank End.	Head End.
Init'l cyl. press...	141	139
M. E. P	124	124
I. H. P.....	45.5	47.



Miles per hour.... 13
Boiler pressure... 165

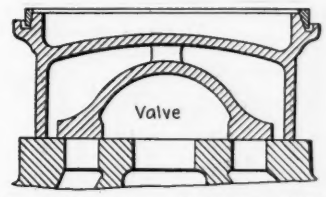
	Crank End.	Head End.
Init'l cyl. press..	140	140
M. E. P	72.1	71.7
I. H. P.....	117.5	120



Miles per hour 32
Boiler pressure....165

	Crank End.	Head End.
Init'l cyl. press..	132	130
M. E. P.....	25	24.2
I. H. P.....	102	101.6

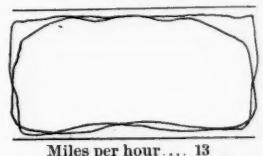
Fig. 6 —Cards Showing Steam Distribution of Freight Engine No. 623



Dimensions of Valve.
Outside lap..... 1¼ ins.
Inside lap..... ⅛ "
Throw of eccentric...5½ "

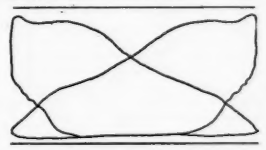
Dimensions of Valve Seat.
Width of steam ports ....1¾ ins.
Width of exhaust ports. 3 "
Width of bridge ....1¾ "

LEFT SIDE.



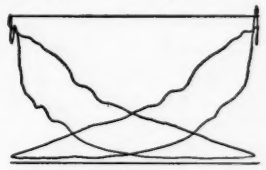
Miles per hour.... 13
Boiler pressure...155

	Crank End.	Head End.
Init'l cyl. press.....	144	146
M. E. P.....	129	128
I. H. P.....	122.8	124



Miles per hour.... 30
Boiler pressure...165

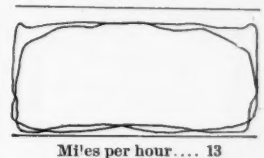
	C an< End.	Head End.
Init'l cyl. press....	154	154
M. E. P	86.7	86.7
I. H. P.....	187.3	190.7



Miles per hour.... 62
Boiler pressure...178

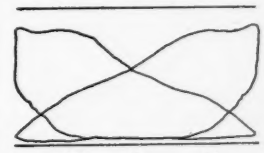
	Crank End.	Head End.
Init l cyl press....	160	1 2
M. E. P.....	46.4	43.7
I. H. P.....	213	205

RIGHT SIDE.



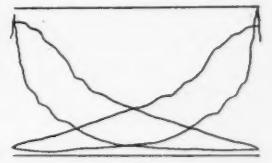
Mi'es per hour.... 13
Boiler pressure...155

	Crank End.	Head End.
Init'l cyl. press. 136		136
M. E. P.....	119	120
I. H P.....	113.2	116



Miles per hour.... 30
Boiler pressure...165

	Crank End.	Head End.
Init'l cyl. press.....	143	144
M. E. P.....	76.6	79
I. H. P..... ...165.5		174



Miles per hour... 62
Boiler pressure...178

	Crank End.	Head End.
Init'l cyl press....	162	156
M. E. P.....	42	41
I. H. P.....	192.8	192

Fig. 7 —Cards Showing Steam Distribution of Passenger Engine No. 962,

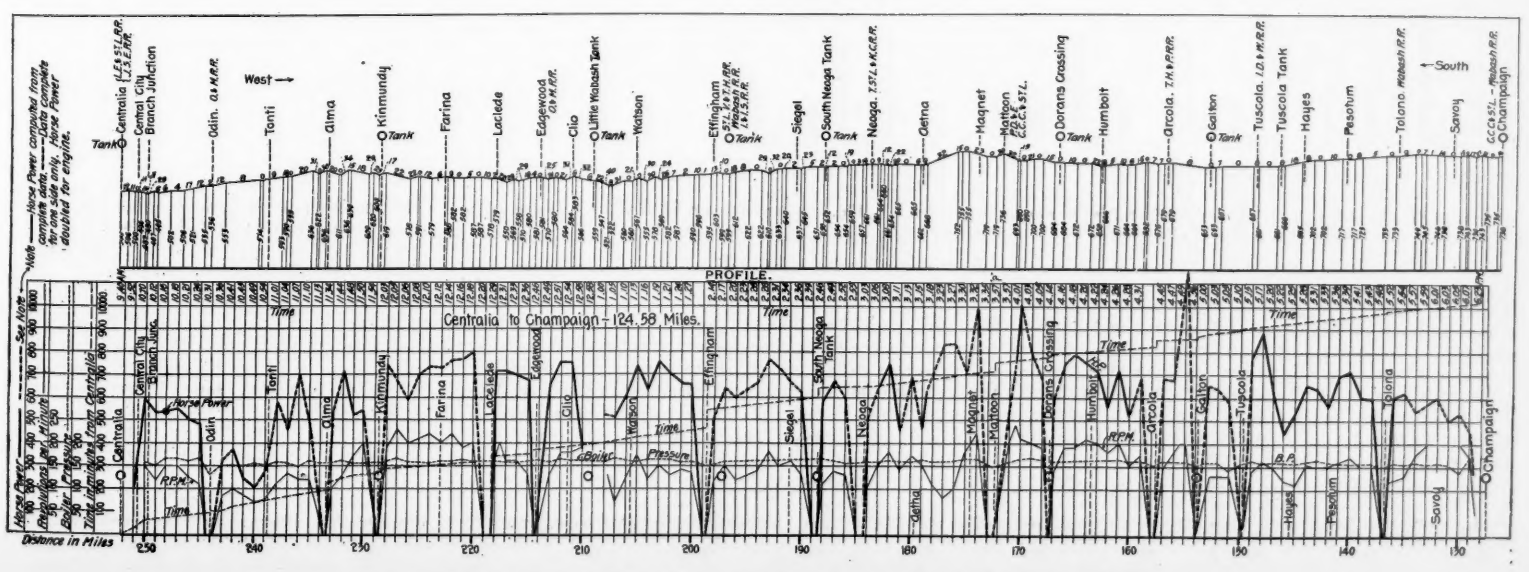


Fig. 8.—Graphical Record of Road Test, May 15, Engine No. 409—Illinois Central Railroad.

these tests is got from the fact that on the date above named 256 indicator diagrams were taken from the right-hand cylinder, and 276 from the left-hand cylinder. In this test the weather was clear, and 26 stops were made. The maximum indicated horse-power shown was 1160, and the maximum speed 31.1 miles per hour. The following results were given for the whole time the engine was working:

GENERAL RESULTS—TABLE 1.

Date, 1897.	Train No.	Direction.	Total duration of run.		Coal taken on at	Weight of coal.	Weight of water.	Pounds of water evaporated per pound of coal.	Ton miles.
			Hours.	Minutes.					
Engine 409—Tests made between Champaign and Centralia—124.58 miles.									
May 14.....	85	South.	9	34	Champaign, Effingham.	20,700	100,300	4.85	124,000
" 15.....	62	North.	6	40	Centralia, Effingham.	24,300	96,890	4.00	134,000
" 17.....	51	South.	6	40	Champaign.	14,710	49,930	3.40	45,000
" 18.....	52	North.	6	0	Centralia.	12,400	60,900	4.91	96,000
" 19 ..	85	South.	9	20	Champaign, Effingham.	22 620	91,110	4.03	122,400
" 20	52	North.	6	0	Centralia	15,500	69,800	4.50	111 500
" 21.....	85	South.	7	0	Champaign, Effingham.	13,360	81.820	6.05	112,500
" 22	62	North.	8	10	Centralia, Effingham.	21,170	86,400	4.08	143,600
Engine 623—Tests made between Champaign and Centralia—124.58 miles.									
May 29.....	85	South.	10	15	Champaign, Effingham.	11,136	75,000	6 74	130,000
June 1.....	51	South.	5	50	Champaign.	1,200	42,000	3.50	36,900
" 2.....	62	North.	9	20	Centralia, Kinmundy.	21,520	95,500	4.44	175,000
" 3.....	51	South.	6	10	Champaign.	10,675	43,500	4.07	34,950
" 4.....	62	North.	8	0	Centralia, Effingham.	20,240	85,100	4.21	158,000
Engine 932—Tests made between Champaign and Chicago—127.62 miles.									
June 15.....	24	North	4	30	Champaign.	5,380	43,940	8.17	15,190
" 16.....	3	South.	3	20	Chicago.	12,710	52,000	4.10	18,305
" 17.....	4	North.	3	20	Champaign.	6,320	42,000	6.65	18 305
" 18.....	23	South.	4	30	Chicago.	13,710	52,310	3.82	15,190
" 19.....	4	North.	3	22	Champaign.	7,320	52,770	7.14	29,527
" 19.....	3	South.	3	20	Chicago.	15,200	48.350	3 18	28,485

Average boiler pressure.....158 lbs. per sq. in.
" mean effective pressure .....64.5 lbs. per sq. in.
" speed .....21 miles per hour
" indicated horse-power 589.3
" draft .....7.24 in. of water
" temperature of feed water.....55 deg. F.
Weight of dry coal burned per hour.....3,645 lbs.
Weight of dry coal burned per hour per square foot of grate .....136.1 lbs.
Weight of dry coal burned per hour per square foot of heating surface.....2.58 lbs.
Weight of water evaporated per hour.....14,533 lbs.
Evaporation per pound of coal from and at 212 deg. F.....4.85 lbs.
Coal consumed per indicated horse-power per hour.7.2 lbs.
Coal consumed per ton-mile of train load.....0.181 lbs.

We are indebted to Prof. Breckenridge for information regarding these tests.

The Relation of Wave Motion in Track to Track Joints.

By George Tatnall.

The subject of track joints is a well worn theme. Every one knows all about track joints, nevertheless, no one item of track maintenance causes more worry and uneasiness to all persons connected with that department, from the Engineer M. W. to the section foreman, than this.

Broken splice bars, rails broken within the splices, track thrown out of line in the joints and creeping of track are among the apparently unavoidable causes of worry, the decrease of one, apparently, inevitably increasing one or more of the others. The third one of these has been pretty generally eliminated in common practice, the first and second and fourth will be inquired into to a slight extent.

As generally recognized, the indispensable requisites for a good track joint are as follows: 1st. That it shall consist of as few parts as possible, and that these shall be adjustable to and removable from the rail with ease and celerity. 2d. That it shall not require any special form of rail-end, that cannot readily be formed in the field. 3d. That it shall "holp up" the joint. 4th. That those portions on the outside and inside of the rail shall be precisely equal in strength and symmetry of design, so as to avoid throwing the rail out of line in the joint toward the weaker side. 5th. That it shall wear equally at all points of contact with both leaving and receiving rails. 6th. That it shall bind the rail to the ties by sufficient means to prevent creeping. 7th. That it shall be of such design in shape as not to interfere with the requirements of other branches of track maintenance and operation. 8th. That it shall allow for the necessary expansion and contraction. There is one other requisite quite as important as any of these, that has heretofore been overlooked, which will be mentioned later.

It is not intended here to follow the processes by which these facts have been learned through the six hundred and more patents granted on T rail splices prior to September, 1895, and the scores granted since, nor through the experience gained by the attempted use of these patented designs, although it is interesting to trace the survival of the fittest in the succession of designs up to the angle bars so generally in use at the present time.

In the attempt to secure these requisites in designing a joint it has been heretofore customary to consider the ties as fixed and solid supports under the rail. In the case of suspended joints the two ties are considered as the fixed abutments, and the two rail ends as cantilevers, supported and assisted by the angle bars to carry the weight of each wheel from tie to tie. In supported and three-tie supported joints the joint tie in the one case, and all three ties in the other, have been considered as fixed and solid supports under the rail, on which the angle bars perform chiefly the functions of a vise to hold secure the ends of the rails. In the suspended joints it is particularly interesting to follow the persistence of the "bridge" idea through the hundreds of designs forming the succession from the old time fish-bars to the patterns with the dependent flanges below the base of the rail of the present day. The changes rung on the trussing idea are innumerable, extending from the simple pair of truss-rods, fashioned of web of rail, or to flange of rail, or to base plates under the rail, or even to the ties themselves, through the device of an inverted rail or other block under the rail ends and bolted or clamped thereto, and reaching the numerous designs of dependent flanges of the present day, which vary from a simple loose lip below the rail, through all the stages of bending, to a close contact with the under side of rail base, and even then bending downward and being bolted together under the center.

In the supported joint class the preponderance of the vise idea is just as noticeable, reaching from the old wooden bars, through the innumerable stages of sleeve chairs, and single tie bars and chairs, and combinations thereof to the three-tie angle bar of the present day. As a parenthesis some attempts to combine the two fundamental ideas are noteworthy, especially one, in which, in a three-tie supported joint, truss rods are run from one of the outside ties to the other under the middle or supporting tie.

A close examination of nearly seven hundred designs patented shows that throughout the entire series of both classes, without a single exception, the idea continues unquestioned and fundamental, that the ties are fixed and solid supports, upon which the weights on the joints are to be carried either directly or indirectly. It will be the endeavor in what follows to show the fallacy of this line of reasoning.

Doubtless many are familiar with the exhibit by the United States Testing Department of the Watertown Arsenal at the Chicago Exposition of 1893, and also with the observations taken at that time on track behavior under passing loads, which were made on the Chicago, Burlington & Quincy Railroad in Chicago. Similar tests were made at Allston, Mass., on the Boston & Albany in 1889 and in Jersey City in 1895. All were made under the supervision of Mr. J. E. Howard, who is in charge of the testing department of the Arsenal at Watertown, Mass. The reports of these tests appear in detail in the annual reports for those years, of the War Department, in the reports of the Chief of Ordnance. From the data therein published the following facts are obtained: 1st. That the engine load causes a compression of ties, of ballast, and of underlying roadbed, the latter sensibly felt and measured at a distance of seven feet from the rail. This fact can be, and no doubt has been, many times corroborated by the agitation of a level bulb of an ordinary leveling instrument set up within that distance of a passing train. In the tests made the amount of this compression varied from 0.1 inch under the pony and tender wheels to 0.25 ins. under the driving wheels. 2d. That the influence of an approaching engine was first felt at a point about 10 to 12 ft. ahead of the front pony truck wheel, and manifested itself in an upward bending or lifting of the rail, which came back to a normal height about three feet in front of the truck wheel. The report of 1889, in speaking of this upward wave, says: "The upward movement began when leading truck wheel reached station 1½ (distant 94½ in. from the point of observation at station 10). Increased to a maximum of .0037 in. when truck wheel was over station 5½ (distant 48½ in. from the point of observation at station 10). There was a sudden depression when wheel reached station 6, and normal height was reached when wheel was over station 6½ (distant 36½ in. from point of observation at station 10), continuing to the depression of 0.101 in. under the wheel." (The measurements and distances in parentheses are taken from the diagram accompanying the text). This sudden depression noted is mentioned elsewhere as being "too abrupt to measure accurately." The curve of this advance wave has been plotted in Fig. 1, with the vertical scale exaggerated ten times.

The succeeding experiments give abundant confirmation of these facts, and elsewhere Mr. Howard has stated that "there is probably a greater tensile strain in the head of the rail at the crest of this advance wave, several feet in front of the engine, than there is in the base of the rail under the heaviest driver." These experiments show further a comparative upward bend midway between every two adjacent weights, and micrometer measurements showed a tension of between 4,000 and 5,000 lbs. per sq. in. in the head of the rail at points midway between the loads. Consequently they showed that the surface of the rail under the engine was a wavy line, alternately sinking under a load of one wheel, rising between the loads, sometimes above the normal, to sink again under the next.

Every one is familiar with this wave motion in the rails, but the fact appears to have been overlooked that this motion destroys completely the supposed fixed and rigid support of the ties, on the theory of

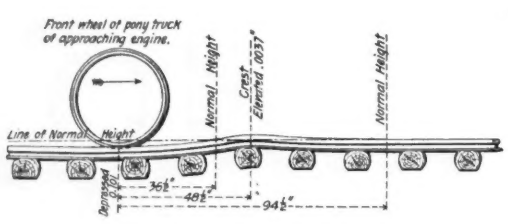


Fig. 1.—Diagram of Advance Wave Plotted from Observations of J. E. Howard.

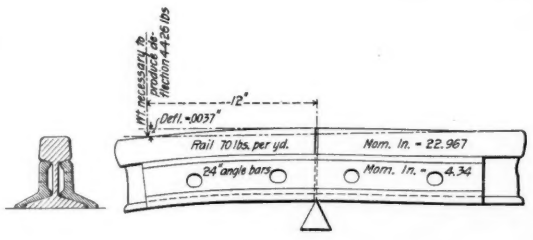


Fig. 2.—Conditions for Calculation Deduced from Fig. 1.

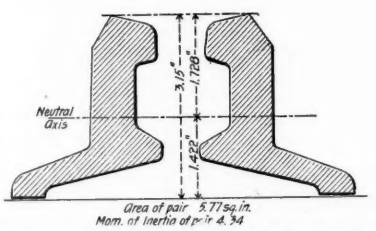


Fig. 3.—Angle Bars for 70-lb. Rail used as Type of its Class for Calculations.

Relation of Wave Motion to Track and Track Joints.

which all joints have been designed. It is also perfectly evident that this wave motion, both as an advance wave and as a wave under the successive loads of a passing train, will produce strains of a kind and amount that have never been considered in designing any track joint now in existence.

Unfortunately, in the experiments referred to, very little attention was paid to the joints, and no data whatever was obtained of the strains produced in them. But enough data is given in the portions quoted above for us, by some calculation, to arrive at an approximate idea of what strains they undergo in ordinary service.

Analyzing the data shown in Fig. 1, as plotted from the extract quoted, we are able to deduce the circumstances shown in Fig. 2. Wherein the rail between B and C is a simple cantilever deflected by a concentrated load on its extremity by the amount which the rail has been raised at C above the normal or .0037 in. As the statement that the sudden depression "was too abrupt to measure accurately" has been neglected, we may be sure that any strains resulting from the condition selected will only err in being too small, as any accurate determination of the conditions would result in decreasing the distance B C resulting in much higher strains at C.

From the formula $D=\frac{Pl^3}{3EI}$ we can calculate the force, applied at B, that would be necessary to cause that deflection. The rail experimented on was a 70-lb. rail with a moment of inertia of 22.967, assuming E modulus of elasticity, at 30,000,000, this formula becomes $.0037''=\frac{P\times(12)^3}{3\times30000000\times22.967}$ or P=4426 lbs. The resulting tensile strain in the head of the rail at C is found to be 3,300 lbs. per sq. in., which may be correct, or which may be multiplied by 8 or by some other multiple depending on whether that deflection is reached in 12 in., as shown, or in 6 in. or other distance shorter than 12. It will be noticed that this confirms Mr. Howard's prediction of the probable strain at this point, which is 48½ in. in front of the head pony truck.

Now let the point C be the center of a joint and put a pair of ordinary angle bars centrally on that point. The standard angle-bars, for 70 lb. rail, of one of the principal trunk lines, as shown in Fig. 3, have been taken for the purpose. As these angle bars are in a vise consisting of the head and base of the rail, the same bending moment operates on them as on the continuous rail, viz., P.×l, while the rail gives no assistance whatever to resist it. The moment of inertia of the pair of angle-bars taken is 4.34 and the distance of the neutral axis from the head is 1.728 in., consequently the moment of resistance is 2.51. From which we find that the resulting tensile strain in the head of the angle bars, from the bending moment of 4,426 lbs. x 12 in., is 21,160 lbs. per sq. in. under quiescent loading.

As we can certainly assume conditions similar or equal to Fig. 2 before every pair of wheels under every car of a train, we can safely assume conditions of indefinite repetitions with reversal of stress, for which we must double the amount already obtained for quiescent strains, and we now have 42,320 lbs. per sq. in. As the traffic will be at all speeds as high as 60 or 70 miles per hour, we can be sure that these stresses will be applied with the most violent shocks, for which we must double the last figure, making 84,640 lbs. per sq. in. as an equivalent quiescent stress to which the splice bars are subjected.

In other words, every pair of splice bars similar to Fig. 3 would be subjected to strains of (as our figures and calculations were approximate and conditions of use vary) from 42,000 to 90,000 lbs. per sq. in. tension in the upper part, or that portion which has always been considered as in compression.

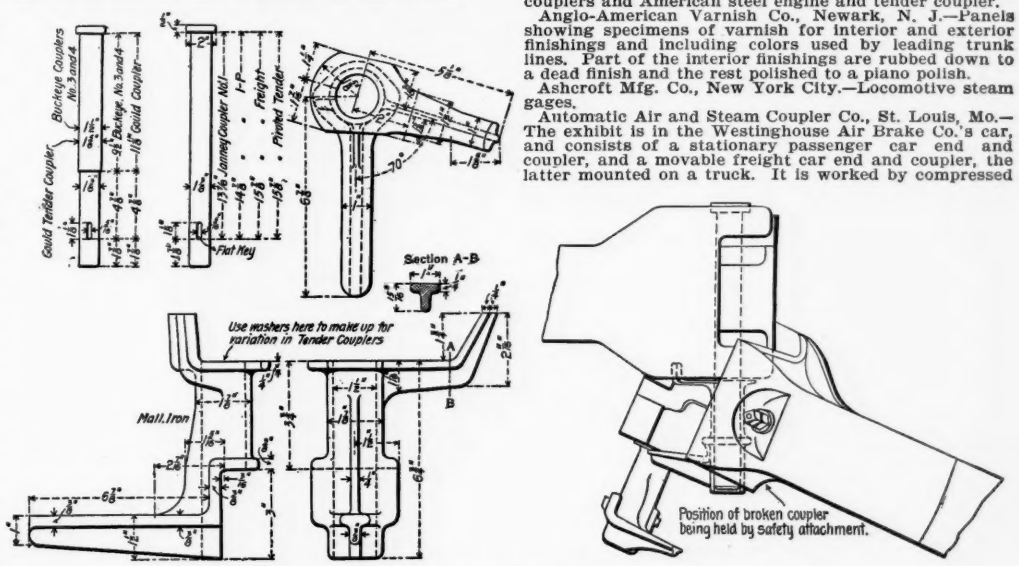
The smaller of these fiber strains is far beyond the elastic limit, and the larger far beyond the breaking strain, as usually specified for the metal in the splice bars, and when it is further considered that, as the bars are in a vise composed of the head and base of the rail, that only so much of the bars as is comprised within the quadrilateral of this vise is really at work resisting this upward bending, with little or no help from those portions outside, it is evident that the smaller of the two fiber strains is much too small, and that the real figure is much nearer the larger of the two. It also leaves no room to wonder why the splice bars break, and break from the top down. It also becomes evident that the methods heretofore in use for designing and testing the splice plates are at fault.

This brings forward the final requisite for a track joint, viz.: That it shall be flexible enough to pass this advance wave through the joint without breaking the rail within its limits, and yet be strong enough to resist the bending moments, both upward and downward, of trains passing at the highest speeds.

It follows that in order to intelligently design a splice the most careful and exact observations should be obtained of the profile into which that particular pattern of rail is depressed under the worst varieties of conditions of loading, of ballast and of road bed, so that the worst conditions of flexure may be definitely determined, and the pattern designed in accordance with the strains so produced.

This adds a feature to the designing of a track joint that has never yet been attained, and which will be very difficult of attainment, for if the splice bars be made too strong or too inflexible the rail will break within their limits, and if too weak they will break themselves, as is now the case. The fact that the heads of the splice bars must be kept out of the way of the wheel flange, after both rail head and wheel tread are worn nearly to their respective limits, places a restriction on the amount of material that can be put in the head of the splice bar, and adds additional difficulty to overcome in the design. This fact has been obviously the chief cause of the many designs in recent years of splice bars with flanges below the rail base, all of which have been made solely under the idea of a "bridge" from tie to tie, which could thus be strengthened, and not in reference to any action of the advance wave motion, to resist which the dependent flange can offer little or no assistance.

The better practical results so often reported as having been obtained by the use of splice bars of such pattern, are more apt to have resulted from their introduction simultaneously with much heavier rail, better ballast or perhaps more or better bearing surface on ties, by use of tie plates, and as a result of any one or all of these, a consequent large reduction in the amount and amplitude of this motion.



Safety Attachment for Automatic Couplers—Baltimore & Ohio Railroad.

And the improvement in many cases has been only of a temporary character, as shown by subsequent reports, the evanescent nature of the improvement being brought about by the rapid increase in the weights of the rolling loads, whereby the wave motion is again increased, and the consequent strains brought again to the point of rupture.

Probably the true solution of this vexed problem lies in the minimizing of this wave motion to the lowest amount consistent with the necessary elasticity of the tracks by heavier rail, thereby distributing the load over more surface, by better and perhaps more, bearing surface of the rails on the ties, by better ballast, and by more compact surface of subgrade, all of which would tend to reduce this wave motion. In addition to this, the heavier rail should have a somewhat greater total depth and width of head, so as to allow of a greater amount of metal to be concentrated in the head of the splice bar, which will allow them to be proportioned more nearly to meet the strains which have been or should be determined by a careful series of observations on the amount of this wave motion.

Coupler Safety Attachment—Baltimore & Ohio Railroad.

The accompanying engraving shows a safety attachment to prevent broken couplers from falling on the track, which has been applied to the couplers of tenders and cars used in passenger service on the Baltimore & Ohio. We are told that before the adoption of this device considerable trouble arose from broken couplers falling on the track, which, in several instances, resulted in disastrous wrecks, and that since the safety attachment has been used in all cases the part has been held up by the attachment.

It will be seen from the drawings that this consists of a malleable iron casting, having an arm 6⅞ in. long. The coupler pin is made of unusual length, so that the casting can be attached to its lower end, and secured by a key in such a position that the horizontal arm projects backward at a slight angle to the center line of the coupler. Should a coupler break in the shank and pull out the broken portion takes a position as shown in the engraving, the safety hook holding it so that the couplers are wedged together and cannot sway from side to side and become disengaged. The attachment is simple and easily applied.

Exhibits at the Master Car Builders Convention.

The following is a list of the exhibits at Congress Hall, Saratoga, on Tuesday night. Most of these were then in place, but some were on the ground and not set up, and while the list is complete at the time of our going to press, further exhibits are expected to arrive, and these will be described next week:

Adams & Westlake Co., Chicago, Ill.—Acme car curtains, car trimmings and signal lamps.

Ajax Mfg. Co., Cleveland, O.—Punching and shearing machinery.

Allen & Morrison Brake Shoe & Mfg. Co., Chicago, Ill.—Composite brake shoes for locomotives and steam and street cars, including one which has run 26,000 miles in elevated railroad service, another in service on a motor car of the South Side elevated (Chicago) for 15 weeks, and a third removed from an electric street railroad and only partially worn, after a service of four months.

American Brake Shoe Co., Chicago, Ill.—One of the new firms to exhibit at the conventions is the American Brake Shoe Co., Chicago, owners of the "Diamond S" brake shoe patents. The Sargent Co., Chicago; Ramapo Iron Works, Ramapo, N. Y.; Parker & Topping, St. Paul, and the Central Brake Shoe Co., Buffalo, N. Y., have the right from the American Brake Shoe Co. to make "Diamond S" brake shoes. The exhibit of this company consists of four "Diamond S" and 20 plain cast-iron shoes worn out in a comparative test on the Wisconsin Central lines, and two "Diamond S" and 10 plain cast-iron shoes from a test on the Great Northern, the records being given in each case. Samples are also shown of the new brake shoe and the expanded steel strips which form a part of the shoe.

American Steel Foundry Co., St. Louis, Mo.—Models of freight and tender trucks and transoms, American steel draft rigging, Talbot and Smith Safety M. C. B. car couplers and American steel engine and tender coupler.

Anglo-American Varnish Co., Newark, N. J.—Panels showing specimens of varnish for interior and exterior finishings and including colors used by leading trunk lines. Part of the interior finishings are rubbed down to a dead finish and the rest polished to a piano polish.

Ashcroft Mfg. Co., New York City.—Locomotive steam gages.

Automatic Air and Steam Coupler Co., St. Louis, Mo.—The exhibit is in the Westinghouse Air Brake Co.'s car, and consists of a stationary passenger car end and coupler, and a movable freight car end and coupler, the latter mounted on a truck. It is worked by compressed air working on a piston to which the coupler is attached by a long piston rod. The air and steam couplings are in one piece carried on a bracket riveted to the under side of the car coupler. Steam and air are supplied by the Richmond compound locomotive.

F. W. Bird & Son, East Walpole, Mass.—The new Torsion-Proof freight car roof.

Boston Artificial Leather Co., Boston, Mass.—Morocco-line, in various colors, for upholstering car seats.

Boston Woven Hose & Rubber Co., Boston, Mass.—Rubber lined cotton fire hose, Vim rubber fire hose, Vim air brake hose and other railroad specialties.

M. M. Buck Mfg. Co., St. Louis, Mo.—Eighteen-inch round steel headlight cases, with three different styles of numbering devices; Wells' patent engine and tail lamps; Cochran wrenches; automatic driven brake release valves and other specialties.

Buckeye Malleable Iron & Coupler Co., Columbus, O.—Buckeye couplers for cars and locomotive tenders.

The E. T. Burrowes Co., Portland, Me.—Car curtains, car curtain fixtures and curtain materials, including pinch handle and cable design car window shades and the waterproof curtain fabric "Oakette."

L. C. Chase & Co., Boston, Mass.—The Sanford Mills mohair car plushes. In addition to the standard grades of plain goods in high and low piles, the company shows a large number of designs in frieze plush that have been generally used by railroads during the past two or three years. A feature of the exhibit is a mounted head of an Angora goat, brought from Asia Minor, which shows the long fleece from which the various grades of Chase car plushes are made.

Chicago Pneumatic Tool Co., Chicago, Ill.—This is one of the largest and most interesting exhibits at the convention, all the tools being shown in operation. The air is supplied by an air compressor built by the Rand Drill Co. The following is a list of the pneumatic tools shown by this company: Tube roller, expander and cutter; staybolt cutter with air hoist; Boyer breast drill; two regular Boyer rotary drills; Whitelaw breast drill; five sizes of pneumatic hammers, Nos. 3 to 0, inclusive; two sizes of yoke riveters; stationary drilling machine driven by a Boyer rotary drill; lathe driven by a rotary drill; a special drill for boring near corners; pneumatic holder-on; Boyer speed recorder.

Chicago Railway Equipment Co., Chicago, Ill.—Full size automatic frictionless side bearings, National hollow brake beams and an air brake controller.

Cleveland City Forge & Iron Co., Cleveland, O.—A turn buckle 8 ft. long, having 5-in. stubs, which weighs 750 lbs.

Cloud Steel Truck Co., Chicago.—Full-size Cloud pressed steel frame for transom truck with a Bettendorf I-beam body bolster complete. Bettendorf body and truck bolsters for diamond frame trucks, together with samples of similar pressed steel parts not riveted together.

W. H. Coe Mfg. Co., Providence, R. I.—Gliding wheels.

Consolidated Safety Valve Co., New York City.—Locomotive pop valves.

Cook Cooler Co., Ltd., Flint, Mich.—Two full-size Cook car journal coolers, and a full-size journal box arranged to show different stages of heat of an axle.

Corning Brake Shoe Co., Corning, N. Y.—Sample brake shoes worn out in service, together with several new shoes.

Crosby Steam Gage & Valve Co., Boston, Mass.—Crosby automatic chime whistle; air brake testing and recording gage; Johnstone locomotive blow-off cock; muf-

(*Continued on page* 439.)

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Lieutenant-Colonel Yorke, one of the inspectors of the British Board of Trade, in reporting on a recent derailment at Tavistock, on the London & South Western, made a recommendation, somewhat surprising at first sight, that rails weighing 82 lbs. to the yard are not strong enough for heavy passenger trains running at more than 40 miles an hour. In the case in question a tank engine with the driving wheels in front, drawing a passenger train of seven cars, ran off the track on a gentle curve without any apparent cause; and after making a careful investigation, Colonel Yorke is obliged to report that no conclusive explanation is forthcoming. The engineman said he was running 40 miles an hour, but it is believed that the rate actually was a good deal higher. The weight on the leading driving wheels of the engine was 16 tons, and on the next pair 18 tons (18 gross tons = 40,320 lbs.), the driving wheel base being 7 ft. 6 in. The rails had been in use about eight years, and when new weighed 82 lbs. per yard. They rested in chairs weighing 40 lbs each, and the cross-ties were 10 ft. long, 10 in. high and 5 in. thick. There are 11 ties to each 30-ft. rail, making the distance from center to center of sleepers about 2 ft. 9 in. Colonel Yorke does not quote the formula on which he bases his conclusion that these rails are suitable only for speeds of 40 miles an hour or less, but Americans, who are surprised at his caution, will note that the space between the ties, as is usual in England, is much greater than in common practice here. The Empire State express of the New York Central, running most of the way at 60 miles an hour, and in many places at 70 miles or faster, runs every day on rails weighing only 80 lbs. to the yard (though much of the track is laid with 100-lb. rails), and formerly ran at the same speed on rails weighing only 65 lbs. to the yard. The engines of this train have about 20 tons (40,000 lbs.) on each pair of driving wheels, the driving wheel base being 8 ft. 6 in. Similar conditions are to be found on the other large roads. But, as everyone knows, the ties in American track are very much closer together than in England, generally 24 in. or less, center to center.

The opinion and decision printed on another page (*Union Switch & Signal Co.* vs. Philadelphia & Reading Railroad), is of great importance to those who make and to those who use automatic electric block signals. It defines the legal standing of the principles and art of automatic signaling so far as concerns the use of the track circuit, and the protection of trains by the display of more than one signal behind a train, and the operation and control of those signals by the arrangement of circuits which has come to be known as the "overlap." The opinion of Judge Acheson confirms the impression which we have long had, that the use of the overlap (which in practice is equivalent to the automatic display of home and distant signals) is free to the world, and that patents can now protect only the specific means by which the results are accomplished. Certain facts which may be read at length in the opinion and decision may be briefly summed up for the convenience of the reader. In 1872 a British patent disclosed a method of working railroad signals automatically by an electric current through a wire circuit and track instruments. This patent provides for the use of distant signals in the caution position as well as home signals in the stop position. A British patent of 1873 also discloses a similar method of doing the same thing and specifically provides for home and distant signals, having the same relations to each other that home and distant signals have in modern signal practice. A United States patent of 1875 also provides for automatic "overlapping signals." A United States patent of 1874 provides for automatic electric signals, overlapped, and as early as 1873 an overlap of 500 feet was in actual use. All of these patents are for systems with wire circuits, but in 1872 a United States patent was granted to Robinson for a closed track-circuit system, and this inventor contemplated the use of any desired number of signals worked simultaneously from a single section of track. The patents sued upon were granted in 1880, 1881 and 1883 and were for means of working block signals automatically by track circuits, but further they show means for the continued display of two signals behind a train, thus reaching the familiar result obtained by the use of home and distant signals. The Judge finds that the purposes of all these patents had been accomplished and revealed to the world in patents or in actual installations of signals before the patents in suit were taken out. These patents do not show pioneer invention and they can only protect their specific means of reaching results.

One of the things in which the railroads have grown more civilized within the last 25 years is in regard for the nerves of their neighbors. They have learned to be less noisy. Loudness in a freight yard may not grate on such a refined portion of men's sensibilities as loudness in the interior decoration of a passenger car (another barbarity which has been corrected); and advancement in professional spirit and a sensitive appreciation of the public interest in financial matters may be more important than either of the other reforms; yet the suppression of pop valves, whistles, and other audible nuisances, has been a decided achievement. This subject is brought to mind by the announcement that the New York Central has ordered four "noiseless" switching engines for use in its large freight yard on the west side of New York City (at Sixtieth street). This yard, when first established, was in what might be called a wilderness, so far as inhabitants are concerned, but the gradual growth of the city has surrounded it with dwelling houses, and it is now near the best residence portion of the city. The aggravation of conditions as compared with thirty or forty years ago is due not only to the greater proximity of the dwellers, who demand quiet, but also to the increased snorting power that has been developed with increase in the size of locomotives. It is perhaps unnecessary to state that the engines ordered are really noiseless; they are two-cylinder compounds, like the one which has been in use in the company's passenger yard at the Grand Central Station during the past two years. This engine, built by the Schenectady Locomotive Works, was described in the Railroad Gazette of April 24, 1896. The engine will burn coke, so that with suitable care in the use of the bell and whistle, the two nuisances, noise and smoke, will be done away with. Moreover, President Callaway has, in response to the complaints of dwellers near the line of the road, promised to have the road engines also use coke in the part of the city referred to. Engines going out will take enough coke on their tenders to carry them beyond the residence district, while those coming in can have a good fire prepared before they reach the yard. The New York Central has also mitigated another offense to dwellers in New York, the noise of the fast trains running over the new four track elevated steel structure in Park avenue. All enginemen have been ordered to limit their speed over this part of the line to 20 miles an hour. About 500 passenger trains pass over the Park avenue line daily, and as the viaduct (a mile long), with its continuous floor and 100 lb. rails, is very stiff, the train enginemen have, since the line was put in use about a year ago, taken the opportunity to run at top speed. Two trains abreast (frequently meeting two others simultaneously) make a good deal of noise when traveling at full speed, and it is no wonder that the Park avenue people remonstrated.

Large Freight Engines.

By far the most striking feature of modern locomotive construction has been the building of heavy freight engines, notably the twelve-wheelers for the Great Northern Railway, and the new consolidation engine of the Pennsylvania Lines, the latter having been illustrated in our last issue. These heavy engines are, partly at least, the outcome of rating locomotives and trains on a tonnage basis, and it is not possible to say where the maximum limit of economical weight and capacity will be found. The engines built but a few years ago and considered at that time to be as large as could well be used, are now small in comparison with these latest productions.

On both of the above roads, the big engines are used only on heavy grades, and at low speeds are able to exert enormous tractive effort. They are, however, in the nature of special machines for a special service, and it is safe to say that it will be a number of years before such heavy engines can be used to advantage on any considerable number of roads in general freight service.

While it is commonly known that the capacity of freight and passenger engines has been considerably increased within the past few years, yet it may be interesting to see some figures showing which of the principal dimensions have been most affected by these changes. Obviously such a comparison could be carried to great length for all the different types, but as the consolidation is the one commonly used in very heavy freight traffic, and will probably continue to be so used, we limit ourselves to this type as developed on a single road. We have therefore selected the standard consolidation engine of the Pennsylvania Railroad, built after December, 1889, class H-3a, and one of the same type, class H-4, built for the Pennsylvania Lines West of Pittsburgh in 1897. The following table contains the principal dimensions, with the per cent. of variation in each case:

	Class H-3a	Class H-4.	Variation in per cent.
Weight on driving wheels..... ... lbs.	113,800	166,100	+46
Weight, total..... .....lbs.	124,800	174,300	+40
Heating surface firebox ....sq. ft.	140.3	154	+9
Heating surface tubes..... ... sq. ft.	1,358 0	2,316	+70
Heating surface, total..... .....sq. ft.	1,498.3	2 470	+65
Grate area ....sq. ft.	31 5	29.7	- 6
Driving wheels..... ..... in.	50	56	+11
Cylinders ..... in. x in.	20 x 24	22 x 28	..
Piston displacement..... cu. in.	7,540	10 644	+41
Size of firebox..... . .. . in x in.	42 x 108	40 x 106	....
Boiler type.....	Belpaire.	Belpaire.	
Boiler working steam pressure, lbs. per sq. in.	140	185	+32
Boiler inside diameter of barrel. .. in.	60	68	+13
Boiler length between tube sheets. ft in.	12 — 10	14 — 0	+9
Tractive power with M. E. P. equal to four-fifths of boiler pressure.....lbs.	21,500	35,800	+67

In this instance, while the tractive weight has been increased 46 per cent., the theoretical tractive power has been increased 67 per cent., the ratio between the theoretical tractive power and the weight on the drivers being 18 per cent. for the class H-3a, and for the H-4, 21 per cent. The proportionate increase in the boiler capacity should also be noted, the increase in total heating surface being 65 per cent., while the piston displacement has increased but 41 per cent. The size of the firebox has been but little changed, while the additional heating surface is almost entirely that of the tubes. The grate area in the later engine has actually been decreased, showing probably that the limit to the size of deep fireboxes has been reached.

Plainly any further increase in the capacity of locomotives means a larger boiler with more heating surface, and the fixed clearances of most of the railroads prohibit any considerable advancement along the present lines of construction, while the strength of bridges and track forms a serious obstacle to greater weights. In view of the past experience it is quite likely that some plan may be devised for building locomotives of still greater tractive power, although the exact way of doing this is not yet apparent. The reduction in the cost of handling freight, made possible by big engines, is such an incentive to greater efforts that the outcome cannot be predicted.

Exports of Locomotives and Some Other Material.

The value of locomotives exported from the United States in the first nine months of the fiscal year 1897-8, that is, beginning with July 1, was $2,791,318. The increase over the preceding like period was 9 per cent. These locomotives numbered 337, making their average value $8,280. The statistics of the

Government do not show the distribution of this item of export abroad, but something of that may be judged from the reports which appear in the Railroad Gazette of orders placed. We find records in our news columns of orders for 270 locomotives placed with our builders since Jan. 1 and intended for foreign markets. It is possible, however, that 20 of these were ordered before Jan. 1; on the other hand, it is probable that we have missed some orders. Of these locomotives 79 are for Japan, 24 for Egypt, 17 for Finland, 36 for Russia, 5 for Brazil, 2 for the Argentine, 6 for Spain, 89 for Manchuria (Eastern Chinese Railway), 2 for Honduras and 10 for New Zealand. Of course, there have been in this time a good many orders for locomotives to go to Mexico, but these we do not include, nor have we included locomotives destined for Canada and British North America. Looking over the record of the last 12 months, we find locomotives exported, in addition to the countries named above, to Korea, South Africa, Chile, Jamaica, Guatemala, San Domingo, India, British Guiana, Nicaragua, Haiti, Trinidad, San Salvador, Porto Rico and Venezuela. Excepting Great Britain, Continental Europe and the Australian colonies, we pretty well cover the world with our locomotives; and we have sold enough to Australia in past years to revolutionize the practice there.

The percentage of locomotives exported to the total built by the contracting shops is not accurately known. Last December we published figures showing that about 31 per cent. of the locomotives built that year (other than in railroad shops) were exported. This is not given as a precise figure, but it is close enough to indicate the value of this trade to locomotive builders. Indirectly, it is of considerable value to the railroads. Obviously, the prosperity of the locomotive builders will, in the long run, reduce prices of locomotives and increase their quality, for it will add to the capital invested and to other facilities for manufacture.

The growth of our foreign trade in locomotives is shown by the table below. Comparing these figures with the figures for 9 months, which we gave at the outset, it is apparent that the export trade of the year 1897-98 will be considerably greater than that of the preceding year, but at somewhat lower prices. An interesting feature of this table is the average value of the locomotives, which indicates that until this year the growth in weight of the locomotives has more than offset the fall in price of materials and in labor cost. But apparently the average value of the current fiscal year is showing the effect of sharper competition for the foreign trade. The price for the first nine months of the fiscal year was $8,280, against $9,514 for the year ending July 1, 1897. In looking over the figures of our great exporting houses we find that the price per ton for the year to May 1 averaged $146 in 1897 and $141 in 1898. This was for standard locomotives. For light-weight locomotives the price seems to have fallen more in the latter part of 1897, but to be running higher now. It is well over $200 a ton.

Exports of Locomotives.

Year.	Number.	Value.	Average value.
1886	52	$333,393	$6,414
1887	58	373,245	6,435
1888	56	407,014	7,268
1889	144	1,227,149	8,521
1890	161	1,280,606	7,954
1891	275	2,424,363	8,816
1892	197	1,717,715	8,719
1893	195	1,794,709	9,203
1894	142	1,028,336	7,241
1895	252	2,397,519	9,442
1896	261	2,512,270	9,625
1897	338	3,225,831	9,514

Cars.

In the first 9 months of the current fiscal year the exports of cars for steam railroads (passenger and freight) are not reported by number, but were $1,019,527 in value. The total for steam and other railroads was $1,193,215. In the same 9 months of the year 1896-97, they were $558,846 in value. For 12 years the exports of cars have been as below, for steam railroads alone.

Exports of Cars.

Year.	Number.	Value.
1886	867	$587,692
1887	1,106	653,298
1888	794	862,405
1889	1,519	1,426,237
1890	3,662	2,689,698
1891	3,902	2,885,250
1892	1,680	1,320,265
1893	1,801	969,871
1894	1,723	1,700,521
1895	1,934	868,378
1896	1,750	1,002,940
1897	....	990,950

As the passenger cars and freight cars are lumped it is not worth while to try to get at the average value. It will be observed that the export of cars has not grown as has that trade in locomotives. Probably the buying nations have built more of their own cars, as would naturally be the case, this being so much simpler than building locomotives. We know this to be true of South America for example, and Mr. Kinder tells us that there is really no reason why China should buy cars. In that country labor is so cheap and wood workers are so skillful that we might rather expect China to soon be able to build cars for export than to be obliged to buy them. The same must be true of Japan, even in greater measure. Naturally, trucks and wheels are likely to be bought by China for some time to come, even if the frames and bodies are built at home.

The export of car wheels has been a very small matter, running as low as $74,495 in 1889, and as high as $140,010 in 1895, and ranging between these figures in the 12 years. Of course a considerable part are for street cars, but they are not reported separately in the Government returns.

Steel Rails.

Until 1897 the steel rail exports were also of little value. In 1887 the total of this item was but $74,330, or 2,241 tons at $33.17 per ton. In that year we made more rails than ever before or since in our history, namely, 2,354,132 tons; but we also built more miles of railroad than ever before or since, about 13,000 miles, and we wanted our rails at home. Exports of rails rose with some fluctuations to $540,797 in 1896, or 22,263 tons. In 1897 they made a prodigious jump to 107,991 tons, or $2,482,208, in total value at almost exactly $23 a ton. That was the year of the great break in association prices. In the first 9 months of the current fiscal year the exports of rails were 128,778 tons, amounting to $2,569,294 in value, or $19.95 per ton. In the same period of 1896-97 these exports were 79,800 tons, and $1,859,081 in total value. At the rate for 9 months we should export 171,716 tons this year.

Pig Iron.

Before we leave this topic of exports of railroad materials we may properly glance at the course of closely allied matter, namely, pig iron. In 1886 we exported only 7,659 tons, valued at $144,852, or $18.80 per ton. The exports grew slowly to 29,862 tons in 1896, valued at 471, 803, or $15.80 per ton. In 1897 the exports of pig iron increased over five times in quantity, to 168,890 tons at $13.80 per ton, or $2,331,771 in total value.

In General.

While it is interesting to observe this growth in exports of certain special products, and while this growth is very important to a few of us, it is really but a small part of our prosperity as a nation. We have been dealing with articles which are exported to the value of two or three million dollars a year, but let us look at articles of great export, noting the values for the year to June 30, 1897, and for the first 9 months of each of the last two fiscal years. These principal items are shown in the table below. The totals which there appear are not the total of the items there given, but are the total values of our exports of domestic merchandise for the several periods.

	1897.	9 months. 1896-7.	9 months. 1897-8.
Animals	$43,568,461	$30,452,977	$35,697,072
Breadstuffs	197,857,219	159,302,045	237,216,713
Copper	33,680,904	22,856,377	23,809,251
Cotton (raw)	230,890,971	202,473,439	196,543,003
Cotton (mfd.)	21,037,678	15,423,873	12,320,467
Manufactures of iron and steel	57,497,872	41,551,177	49,938,699
Leather	19,161,446	13,992,935	15,311,857
Mineral oil	56,463,185	42,596,673	39,257,698
Provisions	137,138,084	102,050,788	121,170,696
Tobacco	29,737,263	20,650,973	18,094,130
Wood and manufactures of	39,624,800	26,868,753	27,144,013
Total	$1,032,007,003	$807,726,317	$910,612,651

Before we leave this interesting subject it is well to call attention to the very significant fact that the United Kingdom takes 46 per cent .of all of our exports, and the United Kingdom and the British colonies and possessions take 56.6 per cent. Russia takes about ¾ of 1 per cent., France 5 per cent., Germany 12 per cent., and our present foe, Spain, 1½ per cent. All of Africa takes only 1.6 per cent., and all of South America 3.2 per cent. These figures ought to be pasted in the top of the hat of every American citizen, they indicate so clearly on which side his bread is buttered.

Mr. Daly's Proposal for Car Service Reform.

At the March meeting of the Central and Western Association of Car Service Officers Mr. J. M. Daly, Superintendent of Transportation of the Illinois Central, read a paper, in which he proposed a combined per diem and mileage basis in place of the present mileage basis for exchange car settlements; and a committee of the Association, after careful investigation, has recommended the adoption of the plan. This plan seeks to remedy the well known defects of the present basis by adopting, not the much-discussed straight per diem, but what Mr. Daly terms an "exchange per diem and mileage" scheme. He contemplates making settlements of balances based on an exchange of "car days;" the debtor road paying the creditor for the balance of car days, on the basis of earnings made by the cars of the creditor road on the lines of the debtor during the month.

Mr. Daly submitted proposed chart forms. On the supposition that during the month of January there were Northern Pacific cars on Illinois Central tracks 20 days, making an aggregate mileage of 200 miles, the statement would be as follows:

Illinois Central Railroad.

Statement of mileage and per diem earnings of Northern Pacific cars on Illinois Central R. R. for month of January:

Miles.	Rate per mile, mills.	Earnings.	Total number of days.	Average miles par car per day.	Earnings per car per day, cents.
200	6	$1.20	20	10	6

The car accountant of the Northern Pacific finds that during the same month Illinois Central cars were on Northern Pacific tracks 15 days, making an aggregate of 900 miles. His record would be as follows:

Northern Pacific Railway.

Statement of mileage and per diem earnings of Illinois Central cars on Northern Pacific Ry. for month of January:

Miles.	Rate per mile, mills.	Earnings.	Total number of days.	Average miles par car per day.	Earnings per car per day, cents.
900	6	$5.40	15	60	36

Using this illustration, it is seen that the Illinois Central owes the Northern Pacific a balance of five days; and as the Northern Pacific cars made an average of ten miles per car day on Illinois Central tracks the Illinois Central pays the Northern Pacific 30 cents, instead of a balance of $4.20 under the mileage basis —"basing the equity of such settlement," Mr. Daly says, "on the ground that their car represents as much capital as ours, and that we had the same opportunity to secure the 60 miles per day from it that they had with our car. Further, had we not permitted their car to be detained on our tracks, but had returned it to them promptly, they could, no doubt, have dispensed with the use of our car by transferring the contents from our cars into their own."

The Northern Pacific, by prompt movement of cars, secured free of cost 700 miles of service, while the prompt return of cars to the Illinois Central enabled the latter to use them in its own traffic; hence both companies are mutually benefited.

Mr. Daly in his paper recited some of the defects of the present plan, coupling with them the advantages claimed for his proposal, as follows:

First: Under the present mileage plan one road can deliver to another cars owned by a third party, to be stored and held for prospective loading, regardless of the wants or wishes of the owner. Under the proposed plan the road receiving and storing these cars is responsible to the owner direct, and must settle for the use of car at the same rate as its cars earn on the tracks of the other company. The result would be that it could not afford to store the cars for prospective business, and if the road making the delivery wishes to secure the traffic it must furnish its own cars, and can then waive the per diem charge, thereby affecting its own revenue instead of that of other companies.

Second: Operating under the present mileage plan a railroad company can permit its consignee to make a storehouse out of another company's car, and the owner of car receives no revenue therefrom.

Under the proposed plan, when a road permits a consignee to hold foreign cars as storehouses, in order to influence other traffic from such consignee, it must pay to the owner of the car the same average earnings per day as its cars make on the tracks of the other company during the same period.

Third: Under the mileage plan a road can defer repairs to foreign cars and hold them indefinitely, as it costs nothing so long as the car is not in motion. Under the proposed plan of settlement the road delaying a foreign car for repairs will lose as many days' earnings as it delays the other cars for repairs.

Fourth: Under the present mileage plan the owner of a car cannot verify the accuracy of the mileage earnings reported. Under the proposed plan the owner can verify the accuracy of the number of days reported, and as both companies exchange car days at an equal ratio, any errors in the number of days reported can be easily detected and correction made, and as one car day offsets another errors in the mileage reported will not affect the revenue due owner of the car, as is the case under the straight mileage plan.

Fifth: Under the mileage plan one company pays another in many instances ten times as much per car per day as it receives from the other for the use of its cars of equal value. In December, 1897, we had on the tracks of a certain railroad 252 cars. They were on that company's tracks a total of 2,423 days; they were reported as used 6,478 miles, which is an average car per day of 2.6 miles, thus earning us 1½ cents per car per day. The result of this interchange is as follows:

Value of car, $450, at 5%	$22.50
Cost of maintenance per annum	40.00
Total of fixed charges	$62.50
Total earnings per car per annum	4.92
Net loss per car per annum	$57.58

During this same period we paid to this other company for the use of its cars on our tracks 12.9 cents per car per day, or eight times as much per car per day as we received for equipment of equal value. Under the proposed plan of settlement we would exchange car days regardless of earnings, which would compel the other company to pay us as much earnings per car per day as we pay to them. This would act as a lever in procuring a more prompt movement and return of our cars.

Sixth: Under the mileage plan belt and switching roads decline to pay railroad companies for the use of cars handled by them, basing their decision on the ground that railroad companies do not pay each other for the use of cars which they switch on their tracks within terminal limits. Under the proposed plan railroad companies would settle with each other on a time basis, even though there is no established rate per day, and sufficient pressure could be brought to bear to secure from the belt road the earnings due

the owner for the use of this equipment on a per diem basis.

As was brought out during the discussion of the paper, the straight per diem basis has always been voted down by the roads which would secure more advantage from the mileage basis, and as the adoption of the per diem basis requires concerted action by a number of roads it has heretofore failed of adoption. Mr. Daly claims for his plan the advantage over the straight per diem plan that it can be put into effect by any road, without the co-operation of any other road, by simply notifying its connections that on and after a certain date car days of equal value will be exchanged, and that it will honor or make drafts for balances on the basis of earnings per car per day reported by the debtor road.

The fact that under this plan an exchange of car days compels one road to pay the other as much per car day as it receives, regardless of the mileage, is the "lever" which Mr. Daly relies upon to secure a more prompt movement of equipment.

Replying to a query as to how the plan would work in case one road, intentionally or unintentionally, failed to report full mileage, Mr. Daly pointed out that in case the road at fault was a debtor it made no difference, as car days only are taken into account. In case it was a creditor road it would benefit to the extent of the difference in the number of days in its favor; but even in this case the proposed plan is 50 per cent. better than the mileage basis. Further, reporting under the proposed system, each road knows just what its cars are earning per day on foreign roads, and if the earnings are shown to be abnormally small a better performance can be demanded, under penalty of withdrawal of equipment.

In reply to one criticism, however, Mr. Daly apparently fails to point out adequate relief under his plan. Asked what he would do in the case of eastern roads who might have Illinois Central cars, but sent none of their cars to the Illinois Central, and therefore settled on the present basis, he answers that, having cars on its line working under the exchange per diem plan, it would be cheaper for it to return all foreign cars promptly instead of sorting out those which it could hold without expense, thus presupposing the adoption of the plan in all sections of the country by a sufficient number of roads to make it practically universal. In the cases where there is no exchange of cars we very much question whether human nature is likely to change to the extent that the average car-service superintendent will neglect to "look out for number one." He will find some way to ease his conscience when he gets hold of a few foreign cars and is himself in a tight pinch for local equipment; he can lecture his station agents for not starting the cars home, but at the same time will tell them that they must not let freight stand for want of cars.

There is no question but that a great majority of the cars of every road fail to make the mileage which they should. Car-service men have for years tried to devise some plan which will bring about an increased mileage and a more prompt return of cars, and any plan which promises to bring this about is certainly worthy of the most careful consideration. The receipt of checks for mileage balances is poor consolation to the manager who is at his wits' end to provide cars for the freight traffic of his line, even though they be of goodly proportions. Mr. Daly does not claim that his plan is perfect, but the arguments which he puts forth in support of it are certainly ingenious and apparently well thought out.

Beggars and flies are always with us—in hot weather; and as far as railroads are concerned, the same is true of the persistent crowd who want everything regulated by law, only this nuisance lasts all the year round. In one state they want bicycles carried for nothing. In another the Legislature is importuned to come to the relief of the abused drummer who cannot use his mileage coupons except in accordance with the reasonable regulations of the railroad companies Just now, down in the Southwest, the drummers are pressing another grievance, that of the car gate. It is not the first time they have presented it, and this grievance is like various others, in that all are rooted in the same purpose—to avoid paying fare. A bill has been brought before the Legislature of Louisiana designed to prohibit the use of gates on the platforms of passenger cars in the state, the ostensible purpose of the proposed law being "to prevent the detention of passengers." We have not heard whether or not the measure has received the approval of the Legislature. Representatives of the Southern Pacific who appeared before the Judiciary Committee to argue against the bill stated that since the gates were put in use on the Atlantic system of that road in April, 1896, the receipts from passengers had shown a decided increase. In the first six months there was an increase of 70,000 local tickets and of $39,000 in the receipts from local passenger travel. In the two years about 9,000 people have presented themselves at the cars without tickets and have been sent back to the ticket office. The use of the gates is incidentally valuable in saving life. The number of passengers killed or injured in entering or leaving cars has fallen off, the gates, which are not opened until a car is ready to stop, and are closed when it starts again, serving to prevent many attempts to get on or off moving cars. The Southern Pacific people called attention to the fact that vestibules, which are just as bad a hindrance, physically, as the gates (which are used on local trains), have not only not been complained of, but have been hailed as the acme of convenience and luxury. But these arguments are not likely to weigh much in comparison with the inalienable liberties of the great American commercial traveler, and so we shall expect to hear of the passage of a law permitting dishonest passengers to continue "dividing" with dishonest conductors.

The war revenue bill, which is now a law, provides increases of the internal revenue tax on beer; for special taxes on bankers, brokers, theaters and other shows, and increased taxes on tobacco. It provides for stamp taxes on bills of exchange, checks, deeds and other legal documents, insurance policies and on inheritances; also on wine, medicine, perfumery and other things. Following are the stamp taxes of special interest to carriers: On export bills of lading, 10 cents; on domestic bills of lading or any duplicate thereof, 1 cent; and failure to issue a bill of lading for each shipment incurs a penalty of $50. This tax applies to railroads, steamboats and express companies and all carriers. On each telephone message charged 15 cents or more, a tax of 1 cent; on surety bonds, each bond, 50 cents; charter party of a vessel not exceeding 300 tons $3, 300 to 600 tons $5, exceeding 600 tons $10; telegraphic dispatches, 1 cent each; passage ticket to any foreign port costing not over $30 $1, $30 to $60 $3, over $60, $5; on every ticket for a seat in a parlor car or a berth in a sleeping car, 1 cent; power of attorney or proxy, 10 cents; warehouse receipts, except for agricultural products delivered by the actual grower, 25 cents. Bills of lading or tickets by vessel to ports of British North America are not taxable. The stamp taxes go into effect July 1, and there are the customary penalties of fine and imprisonment for failure to use stamps where required. A document not stamped as required is invalid. It will be observed that the bill of lading tax of one cent applies to every shipment, large and small, whether by freight or express, but apparently not to extra baggage. The clause relating to telegrams is very brief, as follows: "Dispatch, telegraphic: Any dispatch or message, one cent." On its face this provision would seem to include deadhead and service messages; and we cannot see why it should not be held to include railroad companies' messages over their own wires. Probably, however, the attorney general will try to construct an interpretation, as in the case of section 22 of the tariff law, which will make the law reasonable. The tax of ¼ of 1 per cent. on gross receipts, over $250,000 annually, of oil refineries, applies also to pipe lines.

The fast trains and the question of excess fares between Chicago and Denver are again under discussion at the special meeting of the Western Passenger Association in Chicago this week. The latest complication is the discovery that the excess fare requirement (which applies only to through Chicago-Denver tickets) is being evaded by the purchase of tickets to Omaha and repurchase thence to Denver. On the other hand, the Omaha lines are objecting to the imposition of an excess fare because it will interfere with the stop-over privileges granted on Colorado tickets during the Trans-Missouri Exposition in that city; while the Santa Fe threatens to reduce Colorado rates if the excess fare is taken off. The only satisfactory and sensible solution of the question seems to us to be the withdrawal of the fast trains. High speed is a costly luxury, and the traffic between Chicago and Denver is not large enough to justify it; certainly not unless some way can be devised to avoid running three whole trains for one or two carloads of passengers. Why not run the trains less frequently, or alternately by each of the ambitious roads? But, then, that would spoil the fun for the G. P. A.'s.

Those who have tried taking locomotive indicator diagrams at frequent intervals, in service tests, have doubtless found it inconvenient to replace the cards on the indicator drum for each set of diagrams. Under these conditions it is not unusual to fail to get diagrams exactly at the time the other observations are taken, thus making the final results appear inconsistent. The device used in the Illinois Central road tests, described in this issue, permits two, three or four sets of diagrams to be taken on a single card without seriously interfering one with another. In this way the operator has plenty of time between changing cards to look to the adjustment of his instrument, and is able to do better work. The simple method of attaching the indicator card to the reducing motion rig may also be found better than the usual arrangement.

Elsewhere we give a list of the exhibits at the M. C. B. Convention at Saratoga, and it would appear at the time of our going to press that the number of exhibitors this year will be greater than last year. Considerable delay in setting up the exhibits was caused by the rain on Monday and Tuesday, but by the time the convention opens all the larger exhibits will likely be in place. An unusual number is shown of new devices, which promise to be of practical value. Also in the matter of attendance it would seem that this will be one of the largest conventions so far held, although it is not possible to make any exact estimate of the number. Abstracts of several of the papers are given this week, and the discussion will follow in our next issue.

TRADE CATALOGUES.

Coal Handling Machinery.—C. W. Hunt Co., 45 Broadway, New York City, sends us two recent pamphlets describing "Automatic Railways" and "Cable Railways." These are some of the ingenious and thoroughly mechanical devices built by the Hunt Company for the cheap and convenient handling of coal and merchandise. The automatic railroad is an arrangement for handling coal from the ship to the storage pocket, or in like situations, by an elevated track on which a dump car is run with no power other than that which it stores up in running down an incline to the coal pile. The loaded car, started from the hoist, picks up a cable, by means of which it raises a weight, and then when the load is dumped the falling of this weight starts the car back with momentum enough to carry it to the loading place. One man operates the whole contrivance and does not go to the coal pile with the car, the dumping being entirely automatic. This apparatus has been installed in many different situations under a variety of conditions. An interesting part of the pamphlet is two pages of testimonial letters. In one column are letters written from 20 to 28 years ago, and in a parallel column are letters from the same concerns written in March and April of this year. These tell of the performance of the automatic railroad in the quarter of a century, more or less, that it has been used.

The other pamphlet, "Cable Railways," describes apparatus for handling and stocking coal by cable tramway. This gives plans and other views of a variety of installations in the United States and in Europe.

The Thomson Electric Welding Co. of Lynn, Mass., has issued a 34-page catalogue setting forth the process followed by the company. The principle involved in the method employed was invented by Prof. Elihu Thomson. Electric currents are passed through the abutting ends of the pieces of metal which are to be welded so that the heat is generated at the point of contact, which at the same time becomes the point of greatest resistance. Mechanical pressure is applied to force the parts together while the electric current is used to complete the union. It is believed that by this process the molecules of the pieces being welded are brought in such perfect contact that the weld is better than by any other process. With pieces of small diameters the process is almost instantaneous. Full particulars are given of the apparatus used, together with a list of licensees in the United States. The testimonials from users and others who have carefully examined the apparatus include men well known and standing very high in the electrical profession. Prof. S. P. Thomson says: "One of the most striking features of the process is the precision with which the heat is localized at the spot required." And, speaking of the tests and of the nature of the weld he says: "Such tests, in my judgment, go far to show that a very perfect homogeneity of structure is secured by this method of welding."

Brake Pins, Coupling Pins, Link Pins and Steel Balls.—The Simonds Rolling Machine Co., Fitchburg, Mass., has just issued a new catalogue with illustrations and tables of sizes of brake pins, coupling pins, link pins and other rolled forged specialties, in some instances accompanied by price lists. Steel balls, made by the Simonds patent process, receive special mention.

Foreign Railroad Notes.

The glass works established by the late Frederick Siemens advertises signal glasses of spun glass, for which it is claimed that it is impossible for them to fall out.

A meeting of an organization of socialist French railroad employees was held in April, mainly to urge claims heretofore formulated, that the minimum wage of a laborer at the smaller stations should be 60 to 70 cents per day; at the larger ones, 65 to 80; that the pay of switchmen, brakemen, guards, etc., should be $270 for the first year after their appointment, and that an allowance of 20 cents a day should be made to employees when their duties require them to take meals away from home.

Roumania, which is one of the countries most easily accessible to Russian petroleum, has developed a little petroleum industry of its own. At the beginning of 1896 there were 951 oil wells in its territory and 20 refineries. In the year 1895 about 540,000 barrels were produced, of which 100,000 barrels were exported, chiefly just across the border to Hungary. There has been much speculation in the oil lands and wells and foreign investors have been badly deceived, and it is said that the development of the properties has been discouraged thereby.

Exhibits at the Master Car Builders' Convention.

(*Continued from page 435.*)

fied and plain valves; Crosby thermostatic water-back gage and Brandon rubber pump valve.

Davis Pressed Steel Co., Wilmington, Del.—Four M. C. B. journal boxes, of different sizes, fitted with the Davis "Tight Joint" lids. Also five lids to suit various other designs of boxes.

Detroit Lubricator Co., Detroit, Mich.—Detroit lubricators for locomotives, some of which are fitted with Tippet attachments.

Diamond Rubber Co., Akron, O.—A full line of rubber goods for railroad uses.

Drake & Wiers Co., Cleveland, O.—Plastic car roofing.

Dressel Railway Lamp Works, New York City.—Switch lamps, engine markers, tail markers, cab lamps and torches. The new Herculean steel signal lamp is also shown.

O. M. Edwards, Syracuse, N. Y.—Full-size and models of the Edwards automatic car window.

Facer Forged Steel Car Wheel & Locomotive Wheel Co., Germantown, Philadelphia, Pa.—A new car wheel, forged from one solid piece of steel. An ingot is shown, together with a forged blank wheel, the second stage in the making, and three finished 30-in. wheels. These wheels can be forged in eight minutes.

Fairbanks Co., New York.—Exhibit of the valve department of the company, including a complete line of asbestos disc globe valves, asbestos, bronze and Consolidated metal seat gate valves, asbestos packed cocks, straightway swing check valves, Vulcabeston packing, Nicholson shaft couplings and Oster adjustable die stocks.

Fairbanks, Morse & Co., Chicago, Ill.—Six Barrett ratchet jacks, three Sheffield velocipede cars, one of which was equipped with a gasoline motor, a four-wheel section car and a 6 H. P. gasoline combination water pump, working.

Forsyth Bros. & Co., Chicago, Ill.—Samples of car curtains fitted with Forsyth patent curtain fixtures.

Foster Coupler Co., Chicago, Ill.—Two full-size couplers mounted on movable carriages so as to show the working of the parts coupling and uncoupling.

Gold Car Heating Co., New York City.—Full-size Duplex coil heating equipment for a passenger car, with all connections, working under steam. Also, pressure regulating valves, train pipe valves, steam hose couplings, steam traps, etc., under steam pressure.

Goodwin Car Co., New York City.—Dump car, No. 4242, which has been in service over a year; the weight is 43,000 lbs. and the capacity 125,000 lbs.

Gould Coupler Co., 66 Broadway, New York City.—Full-size Gould couplers and spring buffers and samples of malleable iron and steel couplers.

Hancock Inspirator Co., Boston, Mass.—Hancock inspirators, boiler checks and other specialties, including a new hose strainer described in the Railroad Gazette last week.

Hayden & Derby Mfg. Co., New York City.—Metropolitan locomotive injectors.

Hood Pneumatic Window Co., Pittsburgh, Pa.—Full-size model of a new patent pneumatic window for passenger cars.

Interchangeable Brake Beam Co., St. Louis, Mo.—Five samples of Interchangeable brake beams.

H. W. Johns Mfg. Co., 100 William street, New York City.—A complete line of asbestos roofing, roof coatings and cements, building felt, waterproof sheathing, cement felting, air-chamber coverings, sectional pipe coverings, fire felt, locomotive lagging, sponge felt, asbestos-sponge cement felting, asbestos rope packing, wick packing and sheet packing, vulcanized rope packing, asbestos and rubber cloth, tape and gaskets, asbestos cloths, fireproof rope, cords, twine, rugs, mats and screens, asbestos furnace and retort cement, plastic stove lining and concrete coating and vulcabeston insulation for steam pipes. A dummy boiler, covered with fire felt sectional covering was also shown.

Joyce & Cridland Co., Dayton, O.—Samples of railroad jacks.

The M. E. Kanaly Co., Cambridgeport, Mass.—Car door showing the Standard car door hanger and K seal lock.

Keystone Axle Co., Pittsburgh, Pa.—Three full-size circumferentially rolled M. C. B. standard passenger car axles, one of which has been split in two from end to end to show the solidity of the metal. The process of manufacture consists in rolling a heated round billet between a roll, conforming to the shape of an axle, weighing 32 tons, and a housing fitted with dies weighing 80 tons. By this immense compression, in one heat the axle is formed in taper, journals and collars ready for the lathe in less than 30 seconds.

Kinzer & Jones Mfg. Co., Pittsburgh, Pa.—The Kinzer composition filled brakeshoes to fit either the Kinzer spring connections or the M. C. B. standard brake heads.

Knitted Mattress Co., Canton Junction, Mass.—Car seat upholstered with knitted elastic padding and samples of knit padding for car seats, cab and caboose cushions, sleeping car mattresses.

Lackawanna Lubricating Co., Scranton, Pa.—A complete set of single, double and triple feed locomotive lubricators.

H. C. Laub, Dennison, Ia.—Automatic steam hose couplings, air hose couplings and car couplers mounted on a movable frame to show the operation.

Henry L. Leach, North Cambridge, Mass.—A full-size Leach track sanding device of recent design, allowing discharge of sand while engine is moving either backward or forward.

Leach & Simpson, Chicago, Ill.—Lunkenheimer injectors, lubricators, regrinding valves and brass locomotive fittings.

McCord & Co., Chicago.—McCord journal boxes and a full-size model of the Johnson hopper bottom for coal cars.

McVicar & Sweet, Denver, Colo.—McVicar oil can for locomotives.

Manville Covering Co., Milwaukee, Wis.—Steam pipe and boiler covering.

Massachusetts Mohair Plush Co., Boston, Mass.—Samples of car plushes.

Metallic Flexible Tubing Co., Philadelphia, Pa.—Metallic flexible tubing for protecting rubber hose.

Michigan Lubricator Co., Detroit, Mich.—Improved sight feed lubricators for locomotives.

Michigan Malleable Iron Co., Detroit, Mich.—A full-size Solid M. C. B. car coupler, fitted with the Thornburgh attachment.

Monarch Brake Beam Co., Detroit, Mich.—Full-size Monarch hollow and two styles of Monarch Solid brake beams.

Moran Flexible Steam Joint Co., Louisville, Ky.—Moran flexible joints under both steam and air pressure.

National Car Coupler Co., Chicago, Ill.—Samples of the National M. C. B. car coupler.

National Elastic Nut Co., Milwaukee, Wis.—Samples of elastic nuts.

National Malleable Castings Co., Cleveland, O.—A number of malleable iron castings for railroad use, including the National car door fastener, National journal box and journal box lid, center plates, Coffin car line, sill and brake block pockets, full-size Tower M. C. B. couplers, malleable iron truck and body bolsters. Models of these specialties were also exhibited, together with one of the Eubank car doors.

National Railway Specialty Co., Chicago.—Full size security car door and the N. R. S. self-adjusting journal bearing key, a new device just brought out. This key is illustrated and described elsewhere.

New York Belting & Packing Co., New York City.—Rolls of Ruby, Double Diamond, cloth insertion, and Salamander packings, Double Diamond corrugated matting and an artistic black and gold frame, showing car heating hose attached to Consolidated, Gold, Safety, straight post, Gibbs and Sewall couplings, together with air brake and Red Signal hose attached to air brake couplings. An attractive feature of the exhibit is a large section of interlocking rubber tiling (design in colors), similar to that used in a number of Wagner and Pullman cars, in ferryboats of the Pennsylvania Railroad, transatlantic steamers of the American Line and a number of large modern office buildings. The company's celebrated brand of Test rubber fire hose, rubber lined cotton fire hose, wire lined engine and tender hose, wire wound steam hose for roundhouses and all varieties of water hose for railroad service were also shown, together with a piece of 60-in., eight ply, elevator belt, made for the Baltimore & Ohio Railroad.

A. O. Norton, Boston, Mass.—A complete line of Norton ball bearing and ratchet cars, bridge and track jacks.

Ohio Falls Car Mfg. Co., New Albany, Ind.—Full-size Buckeye freight car truck complete, with wheels and axles.

Oval Brake Beam Co., Philadelphia, Pa.—Three full-size models of Oval brake beams.

Pantasote Co., New York City.—The exhibit of this company deserves special mention on account of its attractiveness. It consists of a section of a palace car furnished with silk tapestry-curtains and gold bronze headlinings, made by the company. The seats were upholstered in Pantasote, a substitute for leather. Pintsch gas was used for lighting.

Pearson Jack Co., Boston, Mass.—Four full-size Pearson ratchet car jacks for steam railroads.

Peckham Motor Truck & Wheel Co., Havemeyer Building, New York City.—Model of a heavy truck for interurban service, known as 14 B.

Peerless Coupler Co., New York City.—Full-size coupler, with model of locking device.

Peerless Rubber Mfg. Co., 16 Warren street, New York.—A well-displayed exhibit of rubber goods, including the famous "Rainbow" sheet packing, "Anaconda" corrugated engine and tender hose, air brake, gas, steam and fire hose, spiral piston packing for Westinghouse air pumps, "Eclipse" sectional gaskets and the various styles of molded gaskets used by the Westinghouse Air-brake Co., car step treads, hard rubber valve discs, gage glass rings, pump valves and rubber matting and belting. Several Peerless hose nipples, recently placed on the market, were also shown.

J. M. Peet, Pittsburgh, Pa.—Model train equipped with hand rails and walks for trainmen extending around the sides and ends of the train.

J. L. Petithomme, East Oakland, Cal.—Car journal boxes with dust-guards, lids and lubricating devices.

Pottier & Stymus Co., New York City.—Two full-size Standard passenger car seats.

Pratt & Letchworth Co., Buffalo, N. Y.—Pooley automatic car coupler, and numerous malleable iron car castings, such as buffer blocks, oil boxes, brake shoe heads, etc. Some of these are bent to show the ductility of the metal. A cast steel locomotive driving wheel center, a crosshead and driving box are also exhibited.

Pyle-National Electric Headlight Co., Chicago.—Half-size working model of an electric headlight, operated either by steam, air or electricity. This apparatus is shown in operation.

Q & C Co., Chicago, Ill.—Brake shoe keys, oil box lid, Wood's car seal lock, McKee air brake adjuster and pressed steel specialties.

Railroad Supply Co., Chicago, Ill.—Hein coupler for cars, and locomotive tenders and pilots.

Richmond Locomotive Works, Richmond, Va.—The "tramp" two-cylinder compound locomotive, No. 2427, which was built in September, 1894.

Safety Car Heating & Lighting Co., New York City.—A stand equipped with several styles of Pintsch lamps connected to show the difference in brilliancy between the ordinary city gas and Pintsch gas. A device for broiling by Pintsch gas, similar to those in use on the New York, New Haven & Hartford, is also shown.

Sams Automatic Coupler Co., Denver, Col.—Models of the Sams automatic coupler.

Schoen Pressed Steel Co., Pittsburgh, Pa.—This company shows four 100,000 lbs. capacity pressed steel hopper bottom coal cars, two built for the Pittsburgh, Bessemer & Lake Erie, one for the Pittsburgh & Lake Erie, and one for the Pittsburgh & Western. The Pittsburgh & Lake Erie car is 29 ft. ½ in. long by 9 ft. 2 in. wide, inside measurements, the cubical contents being 1,200 cu. ft., equivalent to 77,000 lbs. of coal. This car has a pressed steel diamond frame truck. The Pittsburgh & Western car has the same general dimensions as those given above. The Pittsburgh, Bessemer & Lake Erie cars differ in that the inside length is 28 ft. ¾ in., the cubical contents 1,130 cu. ft., or 72,500 lbs. of coal, and one of these has the latest arrangement of the Westinghouse friction buffer and draft rigging, with pocket strap and pressed steel diamond frame trucks; the other has Schoen pedestal trucks, the Westinghouse draft rigging with tail bolt, and has been in continuous service since August last.

William Sellers & Co., Incorp., Philadelphia, Pa.—Sectional model of the new '87 restarting injector, and a similar injector shown in operation. Other specialties are boiler check valves and a new hose strainer.

Sherburne & Co., Boston, Mass.—Soules patent rawhide dust guards.

Simplex Railway Appliance Co., Chicago, Ill.—Full-size models of the Simplex body and car bolsters. These were illustrated in our last issue in connection with the Lake Shore & Michigan Southern 60,000 lbs. capacity box car.

Smillie Coupler & Mfg. Co., Newark, N. J.—Full-size models of the Smillie car coupler.

Standard Car Truck Co., Chicago, Ill.—The Barber metal truck. The principal feature of this truck is the placing of rollers beneath the ends of the truck bolsters so as to give an action similar to that of a swing bolster.

Standard Coupler Co., New York City.—Full-size passenger, freight and tender couplers and a "standard" steel platform, with buffing mechanism mounted on posts so that it can readily be inspected, both from above and below.

Standard Paint Co., 81 John street, New York City.—Model of a refrigerator car showing method of insulation with Giant P. & B. paper, and also the application of P. & B. Ruberoid car roofing.

Standard Pneumatic Tool Co., Chicago.—Four sizes of "Little Giant" pneumatic drills, three pneumatic boring machines and three pneumatic hammers. These tools are all shown in operation, the air being supplied by an air compressor built by the Rand Drill Co.

Star Brass Mfg. Co., Boston, Mass.—Locomotive safety valves and steam and air brake gages.

Sterlingworth Railway Supply Co., Easton, Pa.—Brake beams and the Jonghins steel truck.

J. Timms, Columbus, O.—Samples of the American dust guard.

Volute Nut Lock Co., Fort Wayne, Ind.—Samples of various styles of Volute nut locks.

Western Railway Equipment Co., Chicago, Ill.—Models of the Acme locomotive tender and drawbar pocket, Safety truck end casting and Missouri drawbar attachment and a full-size Houston pneumatic locomotive track sanding device.

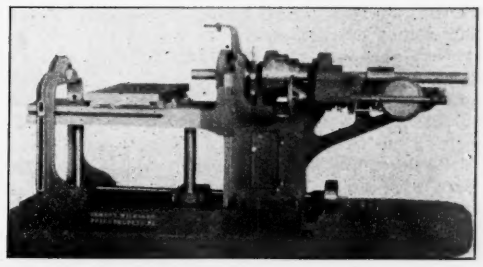
Westinghouse Air Brake Co., Wilmerding, Pa.—This company's exhibit is in its car on the tracks of the Delaware & Hudson Canal Co., near the station. This consists of a full-size section of the latest Westinghouse draft gear and timbers, as applied to wooden cars; also, cylinders and internal parts for steel cars shown in the last issue of the Railroad Gazette. In the front end of the car is a drop test, with a 650lb. weight, by means of which the action of different car buffers is shown. The arrangement for coupling the steam and air hose automatically is shown by a full-size working model mounted on movable carriages; this latest is the exhibit proper of the Automatic Air and Steam Coupler Co., St. Louis, Mo.

Westinghouse Machine Co., Pittsburgh, Pa.—Three-cylinder 55-H.P. Westinghouse gas engine, direct-connected to a Westinghouse generator. This plant is run continuously and furnishes current for numerous electric lights. These engines are designed for use with gasoline, producer gas, natural gas or artificial gas.

William Yerdon, Fort Plain, N. Y.—Samples of air brake, steam and water hose bands.

Horizontal Boring, Drilling and Milling Machine.

A few months ago Messrs. Bement, Miles & Co. brought out a new design of their horizontal boring, drilling and milling machine, of which the accompanying engraving shows size No. 1. There are 10 sizes of this style of machine, the largest of which weighs about 100 tons and is designed for the heaviest class of work. The spindle of the style of machine here illustrated is 2⅞ in. in diameter. The power is



applied by a 4-step cone, which is 15 in. in diameter, for a 3-in. belt. Two feeds are provided for drilling and two for boring. All of these are positive and automatic. By a single movement of a lever the spindle may be moved rapidly in either direction. The main table is raised and lowered by power through connected screws and gearing, and supports a saddle with a transverse table having a hand adjustment. The yoke is adjustable along the base plate and can be clamped to the main table to increase its stiffness.

Diamond Jubilee of the London & South Western.

By W. B. Paley.

A few years ago Americans who visited England scarcely knew the name of the London & South-Western Railway. Now, however, thanks to the energy with which the port of Southampton has been developed, it is nearly as much used by them as the Liverpool & Euston route, and the Sixtieth anniversary of the first partial opening of the line may therefore prove an appropriate occasion for recalling some interesting points in the history of one of the oldest of British railways.

A scheme called the London, Portsmouth & Southampton Dock and Railroad Comany appeared at the end of 1824, but the present line was constructed by the London & Southampton Railway Company under an act of Parliament of July 25, 1834. It was not until 1839 that the present title was adopted. The London terminus was not Waterloo, as now, but on the south bank of the Thames, a little above Vauxhall bridge, in Nine Elms Lane. It still exists almost unaltered, but is now used for goods traffic only. Several lines of rail still cross the street to the wharves on the riverside, and form, perhaps, the only level crossings in London. Horses only are allowed to be used in working trucks over the street and the tramway it contains, a hand-bell being rung to give notice of such passage. As regards gradients, the line was considered to be a very bold, not to say risky, experiment, as about six miles from Southampton it begins to rise eastward steadily, 1 in 250 for 17 miles, to get over a ridge of chalk hills. It was considered by some engineers that this would ruin the whole thing. Planned and begun by Mr. Francis Giles, the railway was virtually executed by Joseph Locke, a pupil of George Stephenson, and who acquired upon it that deep faith in the climbing power of the locomotive that he afterward put into practice so successfully upon the Caledonian and many other lines. The distance from Nine Elms to Southampton was a few yards under 77 miles, but the first portion opened was only 23 miles in length. This was from London to Woking, on May 21, 1838, where it ended on a bare and desolate heath six miles from Guildford. Coaches soon ran to this spot, and were conveyed on railway trucks to and from London, a custom which obtained for some years.

The original engines of the London & Southampton Railway were mostly 6-wheeled, with "single" driving-wheels 5 feet 6 inches in diameter, outside frames and inside cylinders 13x18. The boilers were 40 inches in diameter by 96 inches long, containing from 105 to 138 tubes. In some cases these tubes were only 1⅝ inches in diameter, in others 2 inches, the heating surface varying from 465 sq. ft. to 497.3. The fire-boxes were from 30 to 32 inches long, generally 42 inches wide, the height from bars to crown varying between 36 and 48 inches. These figures give heating surfaces of from 43.4 sq. ft. to 53.5 ft. in the fire-box. The funnels were 13 or 14 inches in diameter, from 63 to 70 inches high, whilst the weight of the engines in running order was 14 to 15 tons. Small 4-wheeled tenders, carrying some 800 gallons of water and 20 or 30 cwt. of coke, were used. The company made their own coke, as was usual for many years on all the principal English

railways. Rails of the reversible or "double parallel" form were laid, some of 63 lbs. per yard, others 73 lbs., laid in small cast-iron chairs. The joint chairs, however, were rather larger. Compressed oak keys 4 inches long for the small chairs and 6 inches for the joint chairs, held the rails firm, the chairs being spiked down to sleepers of practically the same dimensions as are now used. They were all preserved by Ryan's process, remaining in the solution about a week, but it was not apparently forced into the pores, as is done now with creosote.

Little cramped-up band-boxes of coaches were used, with three compartments each, the first-class ones seating six persons and the second-class eight. Luggage was loaded on the roof for many years. The guard had no van, but sat on the top of the last coach, with a screw-brake ready to his hand. It was usual to provide a seat outside every coach, one at each end. The average weight of the passenger trains in 1838 and 1839 was about 38 tons, exclusive, of course, of the engine and tender, which would bring the total weight in motion up to about 60 tons. With such loads speeds of 50 miles an hour were often attained, chiefly down hill, no doubt, from the very first. Ten years later the run to Southampton was being made once a day in each direction in one and three-quarters hours, including a short stop at Basingstoke. "Single" driver engines with 7-ft. wheels were used, the object being to show that the South-Western could do as much on the standard gage as its neighbors, the Great Western, could do on their broad, or 7-ft. gage. About 100 minutes, without a stop, is now the best time, the distance from Waterloo being, however, 78½ miles.

The early signals were perhaps the only feature in which the L. & S.-W. differed much from its contemporaries. They consisted of a round disc, with one-half cut out and the other half left solid. A cord ran round the edge, and, as the disc was pivoted at its center upon a post which could be turned round, several movements were possible. The solid part of the disc indicated that the line towards which it was turned was blocked, and if it was upwards that both roads were stopped. "All right," was given by turning the post so that the disc was presented edgeways to the driver; in fact, by not showing it at all. A few distant signals of this kind were in use within recent years, if, indeed, there are not one or two still left.

The present London terminus at Waterloo was opened in 1848, and after many enlargements covers about 16 acres. About 1,000 full and empty trains and "light" engines are dealt with on a busy day.

The L. & S.-W. is much the largest line south of the Thames, working 941 miles, with 702 engines, 3,618 coaching vehicles of all sorts and 11,391 goods and wagon stock. Some eight and a half millions of train miles were run last year, three-quarters of it by passenger trains. There are 22 steamers for the French and Channel islands traffic. The capital now is about £39,000,000 sterling, and no line in the country is more prosperous and popular.

An "All English" Electric Railroad.

On May 6 we referred to the numerous schemes which have been introduced by the British Electric Traction Co. The Kidderminster-Stourport line is the first of this company's undertakings to be completed. The overhead electric trolley system is employed, and it has been necessary to put the poles on opposite sides of the road in several places; that is, the poles and wires for some considerable distance are on one side of the road only, and then for some distance on the other side of the road, when they again cross, so that there is evidence of the adaptability of the Dickinson side running trolley to the wire in varying positions in its relation to the tramway. The trolley poles, which are tapered steel, are placed about 50 yards apart, standing 22 ft. above the ground, and bedded in concrete to a depth of 6 in. below the surface of the road. There are two trolley wires, one for up line and the other for down line working. Some of the bracket arms are 8 ft. 6 in. and others 2 ft. 6 in. The trolley wire is suspended by riveted gun metal ears, which are in turn suspended from bell insulators fixed to the bracket arms by wrought iron clips.

The tramway is a single line with passing places. It is of 3 ft. 6 in. gage, girder rails (75 lbs. to the yard) being used. Through Kidderminster there is a bed of concrete between the rails, which are paved on either side with granite setts. The remainder has rails laid on sleepers, the permanent way on each side of the track being paved with macadam.

The power plant comprises two Babcock & Wilcox boilers, each of 1,218 sq. ft. heating surface, and capable of evaporating 3,500 gallons of water per hour. A Green's economizer is used, and the scrapers are electrically driven. The boilers supply steam to engines of the Universal type, single crank compound, having cylinders 20 in. and 30 in. by 12-in. stroke. Working steam pressure 135 lbs. This is the first application of the "Universal" (Raworth) engine in traction work. The engines drive two direct coupled six-pole generators provided with Mordey's new chord winding and notched armature. They work at 500 volts pressure and have a normal output of 100 kilowatts, though they are capable of working to 135 kilowatts without a rise of temperature exceeding 80 degrees F. The machines have unusually large diameter in proportion to the width of field, thus allowing ample room for armature winding, notwithstanding the high voltage, and rendering the whole of the windings and connections extremely accessible. A Wheeler surface condenser of the Admiralty type is provided with each set of plant.

The switchboard is divided into six panels, main station, generator, feeder and Board of Trade. The main station panel is fitted with an ammeter showing the total output of the station, and with recording voltmeters and wattmeters, an equalizing switch, and a station clock. The generator panels are each fitted with a magnetic quick-break cutout switch, an ammeter, shunt regulating switch and plug board for station voltmeters. The feeder panels are each fitted with a quick-break cutout switch, ammeter and lightning arrester. There are various instruments fitted on the Board of Trade panel to comply with the special traction regulations of the Board of Trade. All the voltmeters and ammeters have illuminated dials.

The line is divided into half mile sections, in accordance with English practice, by section insulators, at which points the feeder boxes are located. In these feeder boxes there are two main knife switches feeding on to an omnibus bar, from which bar there are four cutout fuses which can feed both ways on to the double trolley wire. Any section can thus be easily disconnected for testing, etc. A cable is connected to the rails at the extreme ends and brought back to the switchboard for testing the drop in the return circuit. The feeder cables are lead sheathed and armored, and are buried 18 in. deep.

There are six closed motor cars and three open trailers, none of them having outside seats. The car bodies are mounted on Brill cantilever trucks, each motor car being equipped with two 15 B. H. P. 4-pole iron clad motors, with spring suspension and geared to the axles with spur gearing. Each car is fitted with a series parallel controller, is lighted electrically and is fitted with a lightning arrester. The trolley pole is a light steel tube 15 ft. long, tapering from 2⅜ in. to ¾ in. outside diameter, and fitted with a swivel head so as to allow the wheel to turn and adapt itself to any position of the trolley wire. The base of the trolley pole is supported on four insulators, as the whole of the pole forms part of the electrical circuit. The complete electrical equipment and the rolling stock were manufactured by the Brush Electrical Engineering Co. of London, and Messrs. Alfred Dickinson & Co. acted as consulting engineers.

TECHNICAL.

Manufacturing and Business.

The Biltmore Estate, Biltmore, N. C., is offering for sale a standard gage 36-ton Baldwin locomotive, with 16x24 in. cylinders, and an 8-wheel tender of 2,000 gals. capacity.

The Mexican Central is in the market for 300 automatic couplers.

At the annual meeting of the National Car Co., held in St. Albans, Vt., June 8, the following Directors were elected: Gilman Cheney, Herbert Brainerd, E. C. Smith, B. B. Smalley, D. D. Ranlett, W. B. Fonda and A. Tuttle. The officers are: D. D. Ranlett, President; F. S. Stranahan, Secretary and Treasurer; H. Brainerd, Auditor; M. D. Greene, Superintendent.

J. W. Gardner, recently connected with the Sterling Boiler Co., and who for a long time was Western manager for Manning, Maxwell & Moore, is now connected with the sales department of the Sargent Company of Chicago.

Chicago grain doors, made by the Chicago Grain Door Co., have been specified on the following cars: 1,000 cars ordered from the Haskell & Barker Car Co. by the Illinois Central, 500 ordered from the Michigan Peninsular Car Co. by the Chicago, Rock Island & Pacific, 1,000 ordered from the Pullman's Palace Car Co. by the Chesapeake & Ohio, and 500 cars for the Minneapolis, St. Paul & Sault Ste. Marie Railway, the order for which has not yet been placed.

The National Railway Specialty Co., 1475 Old Colony Building, Chicago, will hereafter be the Chicago representative of More, Jones & Co., St. Louis, who make car and engine bearing metals.

The Railway Cycle Mfg. Co. of Hagerstown, Ind., has recently received several large orders from foreign countries for their Hartley & Teeter Light Inspection Cars. A cable order from Russia is for a number of the double or two-seated pattern. They have recently sent cars to China, Peru, Germany and Mexico. They state that their trade at home is increasing and that they are not able to keep up with their orders.

Falls hollow staybolts, made by the Falls Hollow Staybolt Co., Cuyahoga Falls, O., have been specified for the ten new engines ordered by the Texas & Pacific from the Rogers Locomotive Co. The company informs us that the roads is dropping the practice of drilling staybolts, as they find the Falls hollow bolt not only more economical at first cost but better in other respects.

We understand that the Chihuahua & Pacific is receiving proposals for the building of eight water tanks, two to be of 50,000 gals. capacity, and six of 30,000 gals. capacity. The general offices of the company are at 80 Broadway, New York.

The Eyeless Tool Co., 26 Cortlandt street, New York, received an order for a car load of eyeless picks from the United States Army for Port Tampa at 2:30 p. m. Saturday. The goods were packed and delivered and on their way South over the Pennsylvania RR. at 9 p. m. the same day.

The American Steel Foundry Co.'s truck and body bolsters have been adopted by the Delaware & Hudson Canal Co., and will be used under the 250 cars recently ordered from the Union Car Co.

The Walker Co. has secured the contract for a 3,000 K. W. generator to run at 75 revolutions per minute and weighing over 300,000 lbs. This machine will be placed in the Albany street station of the Boston Elevated Railway Co.

Iron and Steel.

The plant of the Burgess Steel & Iron Co., Portsmouth, O., was destroyed by fire June 7. It is stated that the loss will aggregate $350,000 and that the insurance is about $200,000.

It is announced that the Southern pig iron combination has collapsed owing to the withdrawal of the Sloss Iron & Steel Co.

It is stated that the mill of the Shelby Steel Tube Co., Greenville, Pa., will shortly be shut down for repairs and improvements. The report says that the improvements will cost about $150,000.

The Union Bridge Co. has filed articles of incorporation with the Secretary of State of New Jersey. The capital is to be $1,100,000. The incorporators are: Joseph Mayer, E. Ludlow Gould, Nathaniel Haven, Charles S. Smith of New York and Geo. A. Miller of Montclair, N. J.

The new power house being built by the Port Chester Street Railway Co. of Port Chester, N. Y., consists of a boiler room, engine and dynamo room. The building has brick side walls, in which are built steel columns supporting the steel truss roof. In the engine room is a traveling crane, arranged so that any part of the engines or dynamos on the floor below can be readily lifted and moved from one place to another. The steel work was designed and is being erected by the Berlin Iron Bridge Co.

It is reported that there are inquiries in the market for rails from Australia, Argentine Republic, Mexico and Japan.

It is stated that the Pennsylvania Tube Works have received an order for 10 miles of open hearth basic steel 8-in. pipe for use on an oil line between Harrisburg and New Jersey.

New Stations and Shops.

The Richmond, Petersburg & Carolina will build a new passenger station at Petersburg, Va., to cost about $25,000 or $30,000. A freight depot 40x250 ft. will also be put up. C. M. Brister of Petersburg has secured the contract for the masonry.

Ground has been broken at Cleburne, Tex., for the new shops of the Gulf, Colorado & Santa Fe. We gave a short description of these shops some time ago.

Contract was let June 9 by the Cleveland, Cincinnati, Chicago & St. Louis to Aug. Ohm for a new passenger station for the road at Terre Haute, Ind. The building will be of stone and pressed brick, with slate roof. The interior arrangement will include all modern improvements and conveniences. There will be a large and well ventilated general waiting room; rooms for women; smoking and toilet rooms; ticket office, baggage and express rooms. The station will cost not less than $40,000. Mr. Geo. W. Kittredge is Chief Engineer of this road.

The Nashville, Chattanooga & St. Louis and the Louisville & Nashville are to build a new terminal at Nashville, Tenn. It is estimated that the cost will be over $1,500,000. Besides the station and transportation buildings, there is to be built a viaduct over Broad street, a viaduct over Church street, a bridge over Walnut street and a bridge over the terminal company's property.

The agitation for a new passenger station at "The Relay," East St. Louis, Ill., appears to have at last come to a head, the officers of the railroads interested having assured the State Railroad Commissioners that the new building will be immediately begun. It is to be completed before the end of the year.

Long Locomotive Run.

The Chicago, Burlington & Quincy has for some time been running one engine on trains No. 48 and 49, between Rock Island and St. Louis, without cleaning the fires during the round trip, making 520 miles continuous running. Train No. 49 leaves St. Louis at 7:50 p. m., and arrives at Rock Island at 6:55 the next morning; No. 48 leaves Rock Island at 7 a. m. and arrives at St. Louis at 5:21 the afternoon of the same day. There is, therefore, only five minutes' stop at Rock Island and two hours and 29 minutes at St. Louis. Beginning Saturday morning, June 4, a class A, eight-wheel engine, 17-in. x 24-in. cylinders and 62 in. drivers, made three consecutive round trips in this service, or a total of 1,560 miles, without

having the fires cleaned. The fires were then drawn so that the boiler could be washed out, when there was but little more mud in the boiler than is usually found at the end of one round trip. This engine was fitted with the Eckerson grate and ash pan, the standard of the Chicago, Burlington & Quincy. There was burned on this long run 39 tons of coal, making an average of 40 miles per ton of coal. The records also show that an average of 283.6 miles was made per pint of valve oil, and 135.7 miles per pint of lubricating oil.

Pig Iron Production in May.

The figures giving the production of pig iron for the month of May, as published in the Iron Age, show a decline in production, due principally to furnaces going out of blast for necessary repairs. On June 1 there were 190 furnaces in blast, with a weekly capacity of 225,398 gross tons, against 194 furnaces in blast May 1, with a weekly capacity of 234,163 gross tons, and against 146 furnaces in blast June 1, 1897, with a weekly capacity of 168,380 gross tons. Stocks, sold and unsold, on June 1, amounted to 823,382 tons, against 841,524 tons on May 1.

Axle Light.

The axle electric light on the Santa Fe has been undergoing some improvement. Some trouble was experienced at first with the belts and also in the switchboard. An automatic idler has been placed on the trucks, equalizing the tension of the belts. The switchboards have been rearranged and work with perfect satisfaction.

Westinghouse Brakes in Russia.

Ambassador Hitchcock writes from St. Petersburg: "I am pleased to report that the Imperial Government has awarded the Westinghouse Co. a contract amounting to between $2,000,000 and $3,000,000 for the equipment of the rolling stock of its railways with Westinghouse air brakes, and that this contract will probably be duplicated in the near future." We told last week of the departure of Mr. Evans for Russia to establish a Westinghouse brake works there.

Chicago Drainage.

Bids were opened by the Board of Trustees of the Chicago Sanitary District at Chicago June 8 for the by-pass along the front of the Pennsylvania yards between Adams and Harrison streets. The lowest bid for the superstructure was that of the Toledo Bridge Co., which was about $94,000. The substructure will cost about $100,000, and 1,500 tons of material will be needed. The object of the by-pass is to widen the channel sufficiently to carry the necessary volume of water, while permitting the railroad to use the surface for freight yards. The contract was awarded June 15, but is not announced as we go to press.

A Belgian Electric Railroad.

United States Consul Morris writes under date of Ghent, May 21, that plans and specifications for the electric railroad between Mons and Bossu have been published by the Minister of Railways; they also include provisions for a complete electric power house. The estimated cost is $125,450, of which $46,320 is for the rolling stock. There is a clause providing that the builder must operate the line for a fixed sum during two years under the Government's control. All the material necessary for the road must be made in Belgium. The entire work must be completed within 25 weeks after the award, and the line must be opened, at the latest, in February, 1899. The road will be about 7 miles long.

Pintsch Lighting.

There are pressing demands on the Safety Car Heating & Lighting Co. for Pintsch gas plants to supply sleeping car equipment, and new plants are in contemplation now for St. Paul, Milwaukee, San Francisco, Los Angeles, El Paso, New Orleans, Memphis and Louisville. There are now 1,581 sleeping cars of the Pullman Company and the Wagner Company in this country equipped for Pintsch lighting, and the gas making and compressing plants, including those mentioned above, will aggregate 47 in number.

Bids for Gun Carriages.

Bids were opened June 8 for furnishing ninety-five spring return carriages for 12-in. breech-loading rifled mortars. Among the bidders were the Dickson Mfg. Co., Scranton, Pa., twenty carriages, $6,950; New Jersey Steel & Iron Co., Trenton, N. J., fifteen carriages, $9,000, twenty $8,700, twenty-five $8,580, thirty $8,470; Southwark Foundry & Machine Co., ten carriages, $6,975, for each additional carriage up to twenty $6,800, twenty-four to sixty $6,600; Builders Iron Foundry, Providence, R. I., ten carriages $5,487, fifteen $5,265, twenty-five $5,175; Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, five carriages $6,000, ten $5,750, fifteen $5,500; Maryland Steel Co., Sparrows Point, ten carriages, $5,600.

Brake Beam Litigation.

Suit has been brought in the United States Circuit Court at Detroit by J. Snowden Bell, Esq., on behalf of the Sterlingworth Railway Supply Co., against the Monarch Brake Beam Co. The suit is for infringement of the Marden patent of Aug. 22, 1882, in the construction of their "solid" brake beam.

Electrical Development at Tokio, Japan.

At the Chicago meeting of the National Electric Light Association, Prof. Fujioka, professor of electrical engineering at the Imperial University of Tokio, spoke in part as follows on the development of electric lighting systems at Tokio: "I saw the advantages of the Edison three-wire system of distribution, so we began to supply the more crowded parts of the city by means of the three-wire system. We subsequently found that it was necessary to supply current to more scattered parts of the town, so we added single-phase alternating current machinery in most of the other stations. When we became convinced of the advantages of the three-phase current transmission we have decided to install one big power station near the river. All the former stations were worked with high-pressure non-condensing engines, and I may state that coal in Japan, particularly Tokio, is very expensive, costing $5 to $6 per ton. So we found that it might be wiser to install a condensing station near the river, having triple-expansion engines. We installed ten triple-expansion condensing engines, each directly coupled to low-speed generators, four of them single-phase and six three-phase. The three-phase generators were wound for 3,500 volts, and the single-phase were wound for 2,000 volts. We did not like to disturb the existing three-wire network in the crowded portions of the city, and we wanted to keep the three-wire network as we have had it for about ten years. The way I have done it was to place induction motors in No. 1 station, taking out all the engines and boilers, and placing the induction motors in the same place as we had the engines. Station No. 3 was converted in a similar way, and in Station No. 2 we have four induction motors, each 150 H. P., directly connected to multipolar direct-current dynamos. Station No. 4 was taken down altogether. In Station No. 5 we took down all the old engines and dynamos, and replaced with three-phase transformers with the four-wire system for alternating current. The other parts are coupled by means of 2,000-volt single-phase currents raising the voltage at the necessary place to the required potential. In that way we have succeeded in reducing a great deal of the expense in fuel and labor items. I cannot tell at present the exact proportion of the decrease, but we know we have reduced the expenses materially."

An Iron and Steel Plant for Japan.

The Journal of Commerce and Commercial Bulletin contains a note in regard to an iron and steel plant to be established by the Japanese Government, the substance of which we give. A commission of engineers was sent to this country and Europe, to inspect some of the best steel works. It is understood that a plant of considerable size has been ordered in Germany, but according to the latest news received from Japan, it appears that recent events have caused those in charge of the arrangements to extend their plans considerably. According to advices, an American expert has been called by the Government to report upon the subject and his opinion shows that to turn out products in an economical way, 13,640,000 yen must be appropriated, instead of the 4,000,000 yen decided on, to be distributed as follows: Plant, 5,238,000 yen; buildings and railways, 4,467,000 yen; buying of mines, 2,640,000 yen; cost of experiments, 396,000 yen; general business, 899,000 yen. The yearly consumption of steel in Japan was estimated at 120,000 tons, and it was arranged to design a plant capable to turn out 60,000 tons yearly. The demand for steel in Japan at present amounts to 240,000 tons a year, and the Japanese authorities are said to have decided to enlarge the equipment of the plant to the capacity of 90,000 tons by April, 1901, and to 180,000 tons later on. It is likely that some of the machinery will be purchased in this market.

THE SCRAP HEAP.

Notes.

Receiver S. M. Felton has introduced fuel premiums for enginemen and firemen on the Columbus, Sandusky & Hocking.

The grain elevator of the Ogdensburgh Transit Co. at Ogdensburgh, N. Y., was damaged by a tornado on Sunday last and 820,000 bushels of grain was nearly ruined by water.

One day last week a freight train of the Atchison, Topeka & Santa Fe was boarded by over 100 tramps near Newton, Kan., and they controlled the movement of the train for many miles.

Judge Seaman, in the United States Court at Milwaukee, has declared invalid the ordinance of the city of Milwaukee requiring the Milwaukee Electric Railway & Light Co. to sell 25 tickets for $1.

A bill has been introduced in the United States Senate for the appointment of a non-partisan labor commission, to consist of five senators, five representatives and nine persons representing industries, the last nine to be appointed by the President.

An express train of the Atchison, Topeka & Santa Fe was stopped by four highwaymen near Dallas, Tex., on June 10, and the fireman was killed. It is said that nothing was stolen. Three days later the sheriffs found the robbers, and after a severe fight captured three of them.

On Tuesday, June 7, the Brown hoist of the Columbus, Hocking Valley & Toledo, at Toledo, discharged into the vessel McWilliams 165 carloads of coal, "breaking the record," it is said. The time occupied was 11 hours, making an average of 15 cars an hour. The weight of the coal handled was 4432.4 tons. No special effort was made to do unusually rapid work. This machine was built last year.

Chicago Track Elevation.

The elevation of the Chicago & Northwestern tracks on the Wisconsin Division from Wood street to North Forty-fourth avenue, Chicago, was completed June 10, so that trains ran over the new tracks. Since this work was begun, about three months ago, 4½ miles of track have been elevated and 27 subways built at a cost of $750,000. It is said that this breaks the record for fast work of this kind in Chicago.

Electrical Transmission Plant Near the City of Mexico.

The Westinghouse Electric & Manufacturing Co. has closed a contract for twenty-three 300 H. P. two-phase generators, with switchboard and transformers, for the San Ildefonso-Tlalnepantla Transmission plant, near the City of Mexico. The current is to be used for lighting and power in the city. The generators are to be direct-connected to water wheels. The terms of the contract call for its completion by March 1, 1899. This project is about two years old and is one of a number of plans to use the waterfalls of Mexico to generate electricity.

The New Jersey County Boulevard Law.

The County Boulevard Law, also called the Squire Trolley bill, was signed June 13. The general plan of the bill, it would seem, is to provide for building grand county boulevards throughout the state. A seemingly minor provision is that authorizing the operation of a street railroad on each such boulevard. Provision is also made for taking lands by appraisement, for the assessment of damages and, in so doing, for taking into account the benefits conferred by the general improvement on the remainder of any lot of land taken.

The residents of Union County, in which is located Elizabeth and Plainfield, believe the bill to be one in the interest of a proposed trolley to connect the two towns by a route through North avenue. North avenue is a country road, 12 miles long, 66 ft. wide, and macadamized. Only recently $120,000 was spent for improvements on it by the county. A great many attempts have been made to get trolley franchises on this avenue, but the residents quite generally refuse consents. The "Union County League" has been organized to oppose any further attempts to utilize the road for electric cars.

International Navigation Company Election.

The annual meeting of the stockholders of the I. N. Co., which operates the American Line and Red Star Line of steamers, was held in Philadelphia June 7. The following Board of Directors was elected: W. H. Barnes, A. J. Cassatt, C. A. Griscom, S. F. Houston and F. L. Potts. The following are the officers as elected at a meeting of the Directors held later: President, C. A. Griscom; First Vice-President, W. H. Barnes; Second Vice-President, J. A. Wright; Treasurer, J. S. Swartz; Secretary, E. Parvin. On account of the war the company is not operating any steamers under the American flag. It has steamers sailing under the British or Belgian flag, both from New York and Philadelphia.

A Terrible Reprisal.

Our amiable Parisian contemporary, Le Journal des Transports, takes seriously the story that American women have decided to buy no more French dresses or bonnets, and casts about to see how the great French people can revenge itself upon the husbands of these obstreperous female Yankees, and it appeals especially to the great transportation companies "which make an enormous use of American machines and apparatus." It is pointed out that these companies can, without trouble to themselves, diminish their importations and gradually come to the point of suppressing them entirely. "These reprisals would have been much more formidable fifteen years ago, at the time when the powerful Westinghouse Air Brake Company installed itself among us, and, thanks to its peculiar methods, succeeded in carrying off the orders for equipping our railroad trains. Since then, taking only the great railroad systems, the Westinghouse Company has equipped more than 25,000 vehicles at a price which has brought to it over 12½ million francs. Counting locomotives and the income from repair parts, the company has undoubtedly received more than 10 million francs net profit from France in the last fifteen years. Hence, as it is proved that there exist in France other brakes quite as good, we ask what interest is there in maintaining the revenues of that American company as long as the Americans persist in treating us as enemies?" We did not know that it had been proved that there exists in France or out of France any other brake as good as the Westinghouse. Further, new brakes must work with old ones, and we fear that our contemporary must find something else to give up. Still further, the Westinghouse brake for French railroad is made in France, at Freinville (Brake City), near Paris.

Fast Run on the Wabash.

On Tuesday, June 7, the new fast train of the Wabash, the Continental Limited, No. 5, ran from Tilton, Ill., to Granite City, 176.6 miles, in 182 minutes, being an average of 58.22 miles an hour. Stops were made at Tolono, Decatur and Litchfield, and the average speed, exclusive of stops, was 61.07 miles an hour. The train consisted of four cars, and was drawn by engine 601 to Decatur, and 602 Decatur to Granite City.

This train, which was put on June 5, has through day cars, as well as sleepers, to and from New York over the West Shore, and sleeping cars to and from Boston over the Fitchburg road. The cars are new and have wide vestibules. Some of them were built at the Toledo shops of the Wabash.

The M. C. B. Coupler in England.

Barnum and Bailey have evidently introduced a new idea into English railways with their special trains. The long trucks and heavy cars required for their work, with bogey trucks at each end, are not unknown here, having been introduced in the Pullman cars on the long runs, but their automatic couplers and air brakes are being studied by railroad men generally, and have given rise to some discussion. This discussion is finding its way into the correspondence columns of many newspapers. With these couplers it is not necessary to step between the cars in order either to couple or uncouple them. The railway arrangements of the big show are much admired by railway men. The manner in

which the heavy "properties" for the performance are handled is not less admirable than the performance itself.—Birmingham Post.

Decision on Bridge Loops.

On Wednesday of last week the Court of Appeals handed down its decision in the case of William R. Hearst, appellant, against John L. Shea and other trustees of the New York & Brooklyn Bridge. The case came up on appeal from the Appellate Division of the first department, reversing an order of the Special Term continuing an injunction granted some time ago to prevent the Bridge Trustees granting permission to lay the loops at the New York terminus. The order of the Appellate Division is sustained, and consequently the loops as now built will remain. The work has been progressing very rapidly on the elevated structure connecting the tracks of the elevated with the bridge road, and it will be but a short time before cars of the different elevated roads are run direct to New York.

Public Works in New York.

The Sinking Fund Commission of New York City has authorized the issue of bonds for carrying on public works in addition to those mentioned last week. An issue to the amount of $2,600,000 for dock improvements is authorized. Of this over 1½ millions is for contracts now in hand and one million for new work. The Commission authorizes the issue of $898,000 for various buildings.

The Galops Canal in Ontario.

John E. Hamilton, Commercial Agent at Morrisburgh, Ont., writes an official report under date May 20, as follows:

The Galops Canal extends from the town of Iroquois (in the county of Dundas), to the head of the Galops Rapids, a distance of about six miles. The work of enlargement now in progress is designed to raise the normal level of the existing canal 6 ft.—that is, to the height of the lowest known stage of water in the St. Lawrence River, above the guard lock at the head of the Galops Rapids. The prism of canal will have a width of 80 ft. on bottom, with slopes of 2 to 1 throughout, and a depth of 15 ft. at lowest water.

A new lock will be built at Iroquois about 200 ft. south of the present one. The masonry will be of the best class of limestone, peck faced, laid in cement, and in courses varying from 18 to 30 in. in height. The lock will have two chambers, the lower to be 530 ft. in the clear and the upper 270 ft. by 50 ft. in width, with a lift of 11½ ft. at normal water, which, at the lowest stage of the river, is increased to 17 ft. The lock will be built during the season of 1898, and it is expected that one-half of the prism will be completed so that vessels with a draft of 15 ft. may pass through with the opening of navigation in 1899. About 1,200 workmen of all classes are now engaged in this work. This enlargement will cost the Government at least $2,000,000.

LOCOMOTIVE BUILDING.

The Louisville & Nashville has placed the order for fifteen locomotives, mentioned in our issue of last week, with the Brooks Locomotive Works.

As mentioned in our issue of last week, the Mexican Central is considering the buying of some new locomotives. It is understood that bids will probably be asked within two weeks.

The Baldwin Locomotive Works have received an order from the Choctaw, Oklahoma & Gulf for one consolidation locomotive for August delivery. This is in addition to the order for one locomotive noted in our issue of May 27.

The exhibit of the Baldwin Locomotive Works at the Trans-Mississippi Exposition at Omaha comprises one ten-wheel engine, built for the Chicago, Milwaukee & St. Paul; one ten-wheel engine, for the Kansas City, Pittsburgh & Gulf, with 20x24 in. cylinders; one eight-wheel passenger locomotive, for the St. Louis, Peoria & Northern, with 18x24 in. cylinders; and one typical switching engine.

The New York Central & Hudson River has ordered, for use in the Sixtieth street freight yard, New York City, four 2-cylinder compound switching engines to be built by the Schenectady Locomotive Works. These engines are of substantially the same design as No. 1, built by the Schenectady Works for the Grand Central Station in 1896, and described in the Railroad Gazette of April 24 that year. They will burn coke. This type of engine has 6 driving wheels and carries a steam pressure of 180 lbs. per sq. inch. The high pressure cylinder is 19 in. in diameter and the low pressure 29 in.; stroke of piston, 24 in.; driving wheels, 51 in. in diameter; heating surface, 1,709.5 sq. ft.; grate surface, 31.24 sq. ft. To still further reduce the noise of the exhaust the dead steam is thrown into a reservoir in front of the cylinders, and there is a device for changing the annular opening in the smoke-box. The exhaust reservoir, in which the exhaust steam is made to pass through perforated plates, and the variable exhaust nozzle, were designed by Mr. Buchanan. These were shown in detail in the description before referred to.

In our issues of April 15 and 22 we noted that the Interoceanic Railway of Mexico had ordered eight locomotives from the Schenectady Locomotive Works. Two of these will be 10-wheel passenger engines, 3 ft. gage, compound, weight on drivers about 60,000 lbs., total weight about 80,000 lbs.; diameter of cylinders, 17 and 27; stroke of piston, 20 in.; diameter of drivers, 48 in.; straight top boiler, 52 in. in diam.; fire-box, 49 1/16 in. long, and 44⅜ in. wide; working steam pressure, 200 lbs.; tank capacity, 3,000 gals. of water and six tons of coal; Westinghouse and American air brakes; Golmar bell ringer; Sellers' injectors; U. S. Metallic packings; Crosby safety valves; Leach sanding devices; Nathan triple sight feed lubricators; A. French Spring Co.'s springs; Crosby thermostatic 6¾-in. steam gages; Latrobe and Midvale tires. The other six will be consolidation simple engines, with weight on drivers, 80,000 lbs.; total weight, 88,000 lbs.; 16x20-in. cylinders; diameter of drivers, 38 in.; straight top boiler, 56 in. in diam.; fire-box, 54 3-16 in. long and 44⅞ in. wide; working steam pressure, 180 lbs.; tank capacity, 3,000 gals. of water and six tons of coal; Westinghouse air brakes; Star headlights; Sellers injectors; U. S. Metallic packing; Crosby safety valves; Leach sanding devices; Nathan triple sight feed lubricators; A. French Spring Co.'s springs; Crosby thermostatic 6¾-in. steam gages; Latrobe and Midvale tires. The consolidation locomotives are to be delivered June 15, and the 10-wheel passenger engines are to be delivered June 30.

As noted in our issue of last week, the Illinois Central has placed orders for twenty-five new locomotives. Four ten-wheel passenger engines and nine ten-wheel freight engines, or thirteen in all, will be built by the Rogers Locomotive Co., and seven ten-wheel freight engines and five switching engines, or twelve in all, by the Brooks Locomotive Works. The general dimensions and equipment are as follows: Passenger Engines: The four ten-wheel passenger engines will have cylinders 19½x26 ins.; drivers, 69 ins. in diameter; weight on drivers, 116,800 lbs.; total weight, 149,700 lbs.; Belpaire boilers; working steam pressure 200 lbs.; fire box, 122⅛ ins. long and 32⅞ ins. wide; tank capacity for water, 4,200 gals.; and for coal, ten tons. These engines will have nickel steel axles; cast steel wheel centers, 62 ins. in diameter; Westinghouse air brakes; cast iron M. C. B. brake shoes; Monarch brake beams; McKeen couplers; one Nathan simplex and one Ohio injector on each engine; U. S. metallic piston and valve rod packing; Ashton safety valves and steam gages; Leach sanding devices; Nathan sight feed lubricators and A. French Spring Co.'s springs. Freight Engines: The sixteen ten-wheel freight engines will have cylinders 20x28 ins.; drivers, 63 ins. in diameter; weight on drivers, 124,000 lbs.; total weight, 158,000 lbs.; extended wagon top boilers; working steam pressure, 180 lbs.; fire box, 120 ins. long and 32⅞ ins. wide; tank capacity for water, 5,000 gals., and for coal ten tons. Seven of these engines will have iron axles and nine nickel steel axles; seven will have Jerome piston and valve rod packing and nine will have U. S. metallic packing for piston and valve rods; all will have cast iron wheel centers 56 ins. in diameter; Westinghouse air and American driver brakes; cast iron M. C. B. brake shoes; McKeen couplers; Monarch brake beams; Heginbottom bell ringers; one Nathan simplex and one Ohio injector on each engine; Leach sanding devices; Nathan sight feed lubricators; A. French Spring Co.'s springs and Ashton safety valves and steam gages. Switching Engines: The five six-wheel switching engines will have cylinders 19x26 ins.; drivers, 51 ins. in diameter, and will weigh 108,000 lbs. The boilers will be of the extended wagon top pattern, with working steam pressure of 150 lbs.; fire box, 112 ins. long and 33⅞ ins. wide; tank capacity for water, 3,000 gals., and for coal, six tons; iron axles; cast iron wheel centers 44 ins. in diameter; Westinghouse air brakes; cast iron M. C. B. brake shoes; Monarch brake beams; McKeen couplers; two Hancock inspirators; Jerome piston and valve rod packing; Nathan sight feed lubricators; A. French Spring Co.'s springs; Leach sanding devices and Ashton safety valves and steam gages.

CAR BUILDING.

The Pennsylvania Railroad has ordered 600 box cars from the Berwick Car Co.

The Rio Grande & Eagle Pass has ordered from the Ohio Falls Car Mfg. Co. 20 coal cars, which we noted they would order in our issue of June 10.

The last of the order for 500 box cars placed by the Lake Shore & Michigan Southern have been delivered by the Buffalo Car & Mfg. Co. They were built from designs prepared by General Master Car Builder A. M. Waitt.

As mentioned in this column last week, the Northern Pacific has asked bids on several hundred box cars of 70,000-lbs. capacity. We are now officially informed that it is not definitely settled whether these cars will be ordered, and that no contract will be let before the end of this month in any event.

The Northern Pacific is building a sample steel car of 100,000 lbs. capacity. The Gillette-Herzog Mfg. Co., of Minneapolis, Minn., is building the car body, and the railroad company is building the trucks, which will be similar to its 70,000-lb. capacity trucks, only stronger. As mentioned in our issue of last week, plans have been prepared for a number of large steel cars for this road, but no orders will be placed until after the sample car is completed.

On April 29 we noted an order of the Interoceanic Railway of Mexico placed with the St. Charles Car Co. for 50 box and 25 flat cars. They will be of 40,000 lbs. capacity, will weigh 18,500 lbs., will be 30 ft. 6. in. long, 7 ft. 8 in. wide, 6 ft. 3 in. high, and will be built of wood, with wooden under frame. They will be equipped with Westinghouse brakes, link and pin couplers, continuous draft rigging, A. French Spring Co.'s springs, their own standard trucks, chilled wheels, 28 in. in diameter. Forty-five of the box cars will be equipped with Wagner doors and five with Lawler doors. Thirty of them will have Chicago-Cleveland roofs and 20 link roofs.

BRIDGE BUILDING.

CAMDEN, N. J.—Plans have been prepared and bids will soon be asked for building a steel bridge over Cooper's Creek. It will be 150 ft. long and will cost about $20,000. Dr. J. B. Davis, chairman, Bridge Committee, Board of Freeholders. (Apr. 8, p. 264.)

CHANGEWATER, N. J.—The Boards of Freeholders of Hunterdon and Warren counties voted to build an iron bridge across the Musconetcong Creek. The new bridge is to have a 90-foot span, with a 16-foot roadway, and will cost about $7,000.

CHICAGO, ILL.—At the regular meeting of the City Council June 6 Commissioner of Public Works McGann gave notice of the dangerous condition of the viaduct at Sixteenth and Canal streets, and recommended that a new structure be built. The matter was referred to the Finance Committee.

CINCINNATI, O.—Judge Taft has issued an order directing the Receiver of the Cincinnati, New Orleans & Texas Pacific to rebuild bridges No. 13 and No. 45 at Eagle Creek and Hanging Fork, respectively, at a cost not exceeding $18,500.

DECATUR, ILL.—Press reports state that a new bridge will be built over Stevens Creek, to cost $2,277.

FORMAN, N. DAK.—It is stated that bids are wanted July 8 for building two bridges. A. H. Carlbohn, Auditor, Sargent County.

HERKIMER, N. Y.—Press reports state that plans are being prepared for a new bridge over West Canada Creek, to be built by the town.

LARIMORE, N. D.—Bids are requested on two steel bridges to be built by the Great Northern, one 1,769 ft. long at Gassman Coulee and the other 400 ft. at Big Mary's Coulee, referred to in the Construction column.

LOS ANGELES, CAL.—A bond issue of $150,000 is authorized, of which it is understood $25,000 will be used for bridge building and repairing.

MOSGROVE, PA.—The plans for the proposed bridge over the Allegheny River, which is to be built by the Allegheny & Western, have been approved by the War Department, and the work, it is stated, is now open for bids. The bridge will be 1,480 ft. long. W. W. Ames, Ridgeway, Pa., is President of the company. (Apr. 8, p. 264.)

NEW YORK, N. Y.—It is stated that Commissioner of Bridges Shea expects favorable action to be taken at an early meeting of the Board of Estimate on the question of new bridges at Blissville and Greenpoint. The Blissville bridge will cost about $70,000, and the proposed appropriation has been referred to the Comptroller.

PETERBOROUGH, ONT.—The City Council has voted $10,000 for bridges.

POCOPSON, PA.—The Supervisors of Pocopson township, Chester County, will build two new bridges over Pocopson Creek.

RUSHVILLE, IND.—Bids are wanted July 6 for building a new bridge between Rush and Fayette Counties.

RUSSELL, MASS.—The town will build an iron bridge on the state road at a cost of $2,500. Appropriations were also made for an iron bridge on the road to Blandford, $500; steel stringers for bridge near the railroad, $900.

ST. JOSEPH, MO.—It is stated that bids are asked until June 27 for building several bridges and culverts, authorized by the court of Buchanan County recently.

SALEM, MASS.—A bill to provide a bridge over the Forest River, between Salem and Marblehead, was advanced to the third reading in the Legislature. The bridge will be built by Essex County.

THURMOND, W. VA.—The Thurmond Bridge Co. is incorporated with a capital of $25,000, to build a bridge at this place. The incorporators are: Dr. W. H. Meyers, Meyersdale, Pa.; H. K. Black, Charleston; J. P. Chapman, Montgomery; Leo Shaffer, Sewell, and S. G. Walker, Thurmond.

WAUSEON, O.—Press reports state that bids are wanted July 5 by the Commissioners of Fulton County, for building the superstructure of a bridge over Ten Mile Creek in Metamora.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Boston, Revere Beach & Lynn.—Semi-annual, 1 per cent, payable July 1.
Chicago, St. P. M. & O.—Preferred, 3½ per cent., payable Aug. 20.
East Mahanoy.—Two and one-half per cent., payable June 15.
Manhattan Elevated.—Quarterly, 1 per cent., payable July 1.
Minneapolis & St. Louis.—Preferred, 1st, 2½; 2d, 2 per cent.; payable July 15.
Oregon RR. & Navigation.—Preferred, 2 per cent., payable July 1; common, 1 per cent., payable July 2.
New York, N. H. & H.—Quarterly 2 per cent., payable June 30.
Northern Central.—Semi-annual, 3 per cent., payable July 15.

United Traction & Electric (Providence).—Quarterly, ¾ per cent., payable July 1.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

American Society of Civil Engineers.—Meets at the house of the society, 220 West Fifty-seventh street, New York, on the first and third Wednesdays in each month at 8 p. m.
American Society of Railroad Superintendents.—Annual meeting, Crossman House, Alexandria Bay (Thousand Islands), N. Y., July 13 and 14.
Association of Engineers of Virginia.—Holds its formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.
Boston Society of Civil Engineers.—Meets at 715 Tremont Temple, Boston, on the third Wednesday in each month at 7.30 p. m.
Canadian Society of Civil Engineers.—Meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.
Central Railway Club.—Meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.
Chicago Electrical Association.—Meets at Room 7,137, Monadnock Building, Chicago, on the first and third Fridays of each month at 8 p. m. J. R. Cravath, secretary.
Civil Engineers' Club of Cleveland.—Meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.
Civil Engineers' Society of St. Paul.—Meets on the first Monday of each month except June, July, August and September.
Denver Society of Civil Engineers.—Meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.
Engineers' Club of Cincinnati.—Meets at the rooms of the Literary Club, 25 East Eighth street, on the third Thursday of each month, excepting July and August, at 7.30 p. m.
Engineers' Club of Columbus (O.).—Meets at 12½ North High street on the first and third Saturdays from September to June.
Engineers' Club of Minneapolis.—Meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.
Engineers' Club of Philadelphia.—Meets at the house of the club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month at 8 p. m., except during July and August.
Engineers' Club of St. Louis.—Meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.
Engineers' Society of Western New York.—Holds regular meetings on the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

Engineers' Society of Western Pennsylvania.—Meets at 410 Penn avenue, Pittsburg, Pa., on the third Tuesday in each month at 7.30 p. m.

Locomotive Foreman's Club.—Meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

Master Mechanics' Association.—Saratoga Springs, N. Y., Monday, June 20.

Montana Society of Civil Engineers.—Meets at Helena, Mont., on the third Saturday in each month at 7.30 p. m.

National Railroad Master Blacksmith Association.—Sixth annual convention, Boston, Sept. 6.

New England Railroad Club.—Meets at Pierce Hall, Copley Square, Boston, Mass., on the second Tuesday of each month.

New York Railroad Club.—Meets at 12 West Thirty-first street, New York City, on the third Thursday in each month at 8 p. m.

Northwest Railway Club.—Meets on the first Tuesday after the second Monday in each month at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

Northwestern Track and Bridge Association.—Meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

Railway Club Secretaries.—Congress Hall, Saratoga, N. Y., June 8, 11 o'clock a. m. H. H. Roberts (St. Louis Railway Club), Secretary.

St. Louis Railway Club.—Holds its regular meeting on the second Friday of each month at 3 p. m.

Southern and Southwestern Railway Club.—Meets at the Kimball House, Atlanta, Ga., on the second Thursday in January, April, August and November.

Technical Society of the Pacific Coast.—Meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month at 8 p. m.

Western Foundrymen's Association.—Meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

Western Railway Club.—Meets in Chicago on the Third Tuesday of each month at 2 p. m.

Western Society of Engineers.—Meets in its rooms on the first Wednesday of each month at 8 p. m., to hear reports and for the reading and discussion of papers. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago.

St. Louis Railway Club.

The next meeting will be held June 25 on board the steamer Andrew Christy, offered to the club by the Wiggins Ferry Co. Additional details about time and place of sailing will be mailed to members.

Western Society of Engineers.

At a meeting of the Western Society of Engineers, Chicago, Saturday evening, June 11, Prof. W. O. Whitney, of the University of Wisconsin, gave a popular lecture, "Three Months Among the Engineering Works of England and France." The attendance was quite large, a number of ladies being present.

New England Railroad Club.

At the meeting held May 10, Mr. Henry Bartlett in the chair, Mr. George M. Carpenter, of the Pocahontas Coal Co., read a paper on "Bituminous Coal and Coal Mining." Mr. Carpenter illustrated his paper with stereopticon views. The club is invited to attend the sixth annual convention of the National Railroad Master Blacksmiths' Association, to be held in Boston, commencing Sept. 6.

Car Accountants.

The International Association of Car Accountants will hold its annual convention at Atlantic City, N. J., June 21 and 22. Following is a list of subjects for discussion announced in the notice of the meeting, with the name of the speaker who will open each discussion: "Checking and Correcting the Light Loading of Freight Cars," T. S. Bell (P. RR.); "Is Tonnage the Proper Basis for Rating the Performance of Engines?" F. M. Lucore (B. & M.); "Commerce in Roman Times," C. O. Scranton (Alliance & Northern); "A New System of Car Records Without the Use of Books, Pens or Pencils," W. E. Beecham (C. M. & St. P.); "Car Hire versus Private Car Lines," S. H. Manchee (Hammond Ref. Line); "The Combined Per Diem Exchange and Mileage Plan," J. M. Daly (I. C.). The per diem exchange plan advocated by Mr. Daly is described in another column of this paper. The President of the Car Accountants' Association is J. J. Merrill, and the Secretary is G. S. Russell.

Illinois Street Railway Association.

The second annual meeting of the Illinois Street Railway Association was held at the Great Northern Hotel, Chicago, June 7 and 8. At the first day's session the following officers were elected for the ensuing year: President, W. H. Patterson; Vice-President, D. B. Sherwood; Secretary and Treasurer, C. K Minary; Executive Committee, W. H. Patterson, D. B. Sherwood, C. K. Minary, B. F. Harris, Jr., Walter Barker, W. P. Cannon and D. A. Belden.

At the second day's meeting Mr. Charles L. Bonney, President of the Chicago General Railway Co., spoke on the "Rights of Street Railroads Under the Constitution." He believed that the schemes now advocated for municipal control were for the most part unconstitutional and suggested as a means of evading municipal interference to resort to federal protection. "The Operation of Street Railroads in Small Cities" was discussed by E. X. Lesseure, General Manager of the Danville Gas, Electric Light & Street Railway Co. The next meeting of the Association will be held at Springfield in September.

Iron and Steel Institute (British).

The Stockholm meeting of the institute will be held Friday and Saturday, Aug. 26 and 27.

A special steamer of over 3,000 tons will be sent by Dr. H. S. Lunn and Mr. Woolrich Perowne on an itinerary to suit the exact requirements of the members who wish to take part in the Stockholm meeting. This vessel will leave Newcastle-on-Tyne on Wednesday, Aug. 17, and will proceed by way of the Baltic Canal, Kiel and Wisby to Stockholm, where she will lie, and serve as a floating hotel, from Thursday, Aug. 25, to Sunday, Aug. 28. The return journey will be by way of Copenhagen, Gothenburg and Christiania. The cruise will occupy nineteen days.

Dr. Lunn and Mr. Perowne have also arranged for the steamship St. Sunniva, a one-thousand ton boat, to leave Leith on Saturday, Aug. 20, proceeding by way of Christiania to Stockholm, where she will lie on Friday, Saturday and Sunday, Aug. 26, 27 and 28, proceeding from Stockholm to St. Petersburg, and returning by way of Copenhagen and the Baltic Canal. This cruise will take twenty-four days.

The Orient Steam Navigation Company, Limited, have rearranged the itinerary of their pleasure cruise No. 3 to the Baltic, so as to bring their steamship Lusitania (3,912 tons) to Stockholm on Thursday, Aug. 25, and to keep her there until Sunday, Aug. 28. The itinerary includes visits to Copenhagen, Wisby, Stockholm, Kronstadt, St. Petersburg, Kiel and the Baltic Canal, and occupies twenty-eight days.

Any other facts may be had from Mr. Bennett H. Brough, secretary, 28 Victoria street, London, S. W.

Northwestern Electrical Association.

According to the plans noted in this column recently, the steamer Northwest reached Chicago June 9, and on June 10 left for Duluth, Houghton and "The Soo," with a large number of members and guests. During the trip the summer convention of the Northwestern Electrical Association was held and the following subjects informally discussed: "Electrical Measuring Instruments," "Lightning Arresters," "Transformers," "Meters," "Arc and Incandescent Lamps," "Motors," "Engines," "Furnaces," and "Mechanical Drafts." A paper on "Electrical Smelting of Ores" was the principal feature of the programme. Over 100 members of the National Electric Light Association went on the trip as guests. After a stop at Milwaukee, the programme was to proceed to Mackinac, where a short stop was to be made. From Mackinac the steamer proceeded to Sault Ste. Marie and Hancock, reaching Duluth on Tuesday, June 14. From Duluth the party proceeded by rail to Minneapolis, where the convention closed with a dinner. One day was allowed for a most interesting visit to the Red Jacket shaft of the Calumet & Hecla mines, the greatest mining shaft in the world, which is 4,900 ft. deep. It has six compartments, each as large as an ordinary shaft, four being used for hoisting rock and lowering timber, one for ladder ways and one for wires and pipes for telephones, light, power, water and compressed air. Underground, the shaft is accurately laid out, the course of the copper-bearing lode permitting work to be planned thousands of feet ahead of the picks. The pumps which free the mine of water are operated interchangeably by compressed air and electricity.

The Engineers' Club of Philadelphia.

The stated meeting held June 4 was called to order by President L. Y. Schermerhorn. Mr. Joseph Appleton presented the paper of the evening, upon "Recent Developments in the Application of Storage Batteries," and illustrated his descriptions with a large series of diagrams and photographic views projected by the electric lantern. He first explained the use of storage batteries in connection with the utilization of water-power for electrical transmission, and described the Buffalo Street Railway Company's installation, which is operated in conjunction with power from Niagara Falls. He next touched upon batteries for equalizing the load on generators and supplying current to fluctuating power loads, and gave a description with efficiency curves of an installation in an office building where Sprague electric elevators and incandescent lamps are run from the same dynamo. A description of the use of batteries in connection with the substitution of electricity for steam on suburban railroads was then given, showing how rapid acceleration can be obtained with a minimum amount of generating plant. Storage batteries are now coming into use in connection with large telephone exchanges, as they have marked advantages over primary batteries. Mr. Appleton then gave a general outline of the history of motor vehicles, with special reference to those employing storage batteries and electric motors, and indicated the probable future of this class of carriages. The paper concluded with a description of the storage-battery plant in the station of the Edison Electric Lighting Co. of Chicago, which is the largest storage-battery plant in the world.

The reading of the paper was followed by a general discussion upon its subject.

By means of the electric lantern, Mr. L. Y. Schermerhorn exhibited reproduction of the Hydrographic Bureau's map of the harbor of Santiago de Cuba, and called attention to the tortuous character of the channel, and to its widths and depths in various parts.

National Electric Light Association.

The convention of this Association was opened by President Samuel Insull in Chicago, on June 7, at 10:30 a. m., with about 400 members and guests present. The opening address was delivered by President Insull, of Chicago, and discussed the growth of the electric lighting industry and the methods which enabled American manufacturers to sell their goods in competition with those made in Europe. Mr. Insull also dealt with the question of municipal ownership or private control and operation of lighting plants. President Insull's address was followed by a paper on "Cost of the Generation and Distribution of a Unit of Electricity," by Calvin W. Rice, Brooklyn, N. Y., and a topical discussion on "Prices and Discounts for Electric Current, and Methods of Billing Current to Customers." The afternoon session was opened by Alexander Dow, of Detroit, Mich., whose paper on "Public Lighting with Relation to Public Ownership or Control" was written with the purpose of setting before the Association a proposed policy regarding this question. The discussion of this paper and of President Insull's address showed that the Association is opposed to municipal ownership, and believes it contrary to the interests of a city either to own its own plant, or to set contractors bidding against each other for city contracts. Mr. Dow's paper was followed by a topical discussion on "Legislative Policy as to Public Service Corporations," and an executive session closed the afternoon meeting.

Wednesday, at the morning session, papers were presented by Herbert A. Wagner, of St. Louis, on "General Distribution from Central Stations by Alternating Currents," and on "General Distribution from Central Stations by Direct Currents," by Louis A. Ferguson, of Chicago. The discussion of these papers was followed by a topical discussion on "Standardizing Apparatus for Central Station Use." In the afternoon a paper by W. McLea Walbank, Montreal, Canada, on "Cost of Producing Electric Power by Water Power from Lachine Rapids, Canada" was read. The Committee on "Standard Candle Power of Incandescent Lamps," Dr. Louis Bell, Chairman, reported, and an executive session was held. In the evening, at 8 o'clock, a lecture was given by Joseph Wetzler, of New York, on "Electricity Direct from Coal," which was illustrated.

Thursday, at the morning session, Prof. Winder Elwell Goldsborough, Purdue University, read a paper on "Transformer Economy," which, like the paper by Mr. Walbank, on "Cost of Electric Power by Water Power," led to extended discussion. The committees on "Amendments to Freight Classification" and on "Legislation Concerning Theft of Current," James I. Ayer, Chairman, also reported. Thursday afternoon there was a topical discussion on "Freight Rates on Electric Apparatus," and a report from the Finance Committee, John A. Seely, Chairman, and the three days' meeting closed with the election of the following officers for the ensuing year:

President—A. M. Young, Waterbury, Conn.

First Vice-President—E. H. Rollins, Denver, Colo.

Second Vice-President—F. A. Gilbert, Boston, Mass.

Secretary and Treasurer—George F. Porter.

Master of Transportation—C. O. Baker, Jr.

Executive Committee—Samuel Insull, Samuel Scovil, E. H. Atkinson, F. A. Copeland, John A. Seely, A. J. DeCamp, E. H. Stevens, W. W. Bean and W. McLea Walbank.

Before adjournment the following resolution was adopted: "Resolved, That the annual meeting shall be held in May or June in each year alternately in the cities of New York and Chicago, unless otherwise directed by the executive committee, and on such date as the committee determines."

PERSONAL.

—Mr. Percy Roberts, Attorney for over 20 years for the Pullman Palace Car Co. in the Southern States, died at Alma, Mich., June 7, at the age of 64.

—Mr. Abijah Weston, President of the Manistique & Northwestern, with office at Painted Post, N. Y., died at Tonawanda, N. Y., June 6, at the age of 75 years.

—Mr. E. D. Spencer, General Agent of the Passenger Department in New York of the Great Northern, was married June 9, to Miss Wanamaker of New Rochelle, N. Y.

—Mr. John Hurley, General Foreman of the Machinery Department of the Baltimore & Ohio Southwestern, died on the evening of June 7 at the Mullanphy Hospital, St. Louis, Mo.

—Mr. D. D. Curran, Superintendent of the New Orleans and Northeastern Ry. (Queen & Crescent), was shot and seriously wounded by his stenographer in his office in New Orleans, La., June 14.

—Mr. Edward L. Coster, Assoc. M. Am. Ry. Master Mechanics' Association, Assoc. M. Am. Soc. M. E., has been appointed Assistant in Mechanical Engineering at Columbia University, New York City.

—Mr. G. N. Dillman, a Civil Engineer in the employ of the Astoria & Columbia River, committed suicide on the afternoon of June 2 in Spokane, Wash. Temporary insanity is believed to have been the cause.

—Arthur King, Middletown, Pa., owner of the Middletown Car Works, and also Secretary and Manager of the Middletown Water Co., has received the degree of Master of Arts from Wittenburg College, Springfield, O.

—Mr. William B. Howard, a railroad contractor, died at his home in Chicago June 10. He was born in Massachusetts in December, 1833. He had many large contracts, and built the New York, Chicago & St. Louis Railroad.

—Mr. P. H. Wilhelm, for two years General Agent of the New York Car Coupler Company, has been appointed Agent for the Railway Supply Co. & Hien Coupler of Chicago, and will represent that company at the Saratoga convention.

—Mr. W. H. Hughes, Engineer in charge of bridge building for the Sanitary District of Chicago, has resigned, stating as a reason that the condition of the work of the Drainage Board is now such that his services are no longer needed.

—Mr. George G. Clay, District Superintendent of the Wagner Palace Car Co. at Grand Rapids, Mich., has received a commission as Lieutenant in the United States Navy. Mr. Clay is a graduate of Annapolis of the Class of 1863, and served in the Navy for 18 years.

—Mr. Josiah Pierce, Jr., of the District of Columbia, Capt. James A. Irons of the Twentieth Infantry and First Lieutenant Spencer Crosby, Corps of Engineers, U. S. Army, have been appointed by the President to be Engineer Officers, with the rank of majors.

—Mr. Charles M. Pratt, General Agent of the Immigration Clearing House of the Western Passenger Association, with office at 1 Broadway, New York City, has resigned to accept the chairmanship of the Southwestern Passenger Association with headquarters at St. Louis, Mo.

—A dispatch from London, England, announces the death at sea on June 5 of Mr. Albert P. Massey of Watertown, N. Y. He was Mechanical Engineer of the New York Air Brake Company, and inventor of much of the apparatus made by that company. He was 56 years old. The body was buried at sea.

—Mr. David Russell, heretofore Superintendent of the Brooks Locomotive Works, with office at Dunkirk, N. Y., has been made General Superintendent. As reported last week, James McNaughton, Superintendent of Motive Power of the Wisconsin Central, has been made Superintendent of the Brooks Locomotive Works.

—Col. Henry M. Roberts, Lieut.-Col. Justus M. Brown, Maj. Alexander M. Miller, Maj. James T. Kimball and Capt. Henry Hodges, Engineer Corps, U. S. Army, have been appointed as an examining board and ordered to convene in the Army Building, New York City, to examine such men of the engineering corps of the regular army as apply for promotion in the Engineering Corps.

—Mr. M. D. Green was elected Superintendent of the National Car Co. at the annual meeting held at St. Albans, Vt., June 8. Mr. Green entered railroad service Sept. 7, 1866, starting as a freight brakeman. He held several clerical positions with railroads for 10 years, and became Clerk of the National Car Co. in 1876, and was made Acting Superintendent in May, 1897, and Superintendent as above.

—Mr. R. H. Soule, who some months ago went abroad in the interest of the Baldwin Locomotive Works, reached New York by the Campania last week. His business took him to Russia and to South

Africa, and so far as we can judge from the news that has reached us, some of which has been published in the Railroad Gazette from time to time, his journey has been very successful.

—News has been received of the recent death of Mr. Edward McDade in the Klondike region. Mr. McDade was at one time Superintendent of Construction of the Canadian Pacific. He was later Superintendent of Bridges on the Lake Shore & Michigan Southern, resigning in 1892 to engage in the lumber business at Seattle, Wash. He left the United States in 1897 for the Klondike region.

—Mr. Stephen A. Harrison, a railroad contractor in the West, died at his home in Milwaukee, Wis., June 7, at the age of 69. Mr. Harrison was a member of the firm of Harrison & Green, which has had many important contracts, including railroad building. He built over 1,000 miles of the Chicago, Milwaukee & St. Paul, and much of the mileage of the Wisconsin Central lines. He had been in railroad building since 1868, and retired about two years ago on account of failing health.

—Mr. H. W. Decker, Air Brake Inspector of the Southern Pacific RR. (Pacific System), died suddenly May 29. One of the principal causes of his death was appendicitis. Mr. Decker had been Air Brake Inspector for the Southern Pacific since 1883, and was in the employ of the Southern Pacific for nearly 25 years. Was about 40 years of age. He was buried in the cemetery at Sacramento, with Masonic honors. Many of the officers of the company and his fellow employees attended the last rites.

—Mr. Gus C. Henning, of 220 Broadway, New York, has been elected a member of the Council of the International Association for Testing Materials, in place of Capt. O. M. Carter, Corps of Surgeons, U. S. A., who was elected a member of the Council to serve until 1900, but found it impossible to act. Mr. Henning is to represent the United States membership officially, receive all payments for dues, etc. A meeting of the members was held on Thursday of this week to form the "American Section" of the International Association, a report of which will be given next week.

—Mr. George E. Bartlett, Superintendent of Bridges on the Fall Brook Railway, with office at Corning, N. Y., died at his home at Watkins Point, N. Y., Friday, June 3, of apoplexy, at the age of 75. Mr. Bartlett was born in Auburn, Mass., in November, 1823, and entered railroad service in 1863 as Superintendent of Construction of trestles, bridges, tracks, etc., used for transshipment of coal from cars to boats on Seneca Lake, Watkins, N. Y. He served in this capacity until 1879, when he was appointed Superintendent of bridges, buildings, etc., on the Syracuse, Geneva & Corning, which is a part of the Fall Brook system, and held that office until his death.

—Captain Harry F. Hodges, Corps Engineers, U. S. Army, who has been appointed Lieutenant-Colonel of the First Regiment Volunteer Engineers, was graduated from West Point in 1881. He was made First Lieutenant in February, 1883, and Captain in May, 1893. He served with the Battalion of Engineers at Willet's Point for four years from September, 1881, and was Inspector of Rifle Practice in 1885. He subsequently served as assistant to Colonel Poe as Principal Assistant Professor of Civil and Military Engineering from 1892 to 1896. He assisted in the river and improvement works at Cincinnati, and on the Missouri River. He is a member of the Board of Engineers in New York City.

—Mr. Warren G. Purdy, the new President of the Chicago, Rock Island & Pacific, entered railroad service thirty-nine years ago with the Illinois Central as a clerk in the office. He left the Illinois Central in 1863, since which time he had been consecutively, clerk with the Ohio & Mississippi, at St. Louis, and chief clerk from February, 1864, to December, 1866, in the Quartermaster's' Department, U. S. Army. In January, 1867, he went to the Chicago, Rock Island & Pacific as bookkeeper in the cashiers office. He was Cashier for about a year, until March 31, 1877, then became Local Treasurer in Chicago, and June 2, 1885, Secretary and Treasurer, and had been Vice-President since Sept. 8, 1887. (June 10, p. 419.)

—Gen. Thomas Lafayette Roser, who recently died, was at one time Chief Engineer of the Canadian Pacific at Montreal. Gen. Roser was born in Campbell County, Va., in 1836. He entered West Point at the age of 20, and at the outbreak of the Civil War entered the Confederate Army as First Lieutenant. He was made Major-General of Cavalry in November, 1864. After the war, Gen. Roser took up the profession of Civil Engineer, and from 1870 to 1879 he was in charge of the Dakota, Yellowstone and Missouri Divisions of the Northern Pacific as Division Engineer. From there he went to the Canadian Pacific. In 1888 he returned to the United States to become President and General Manager of the New South Mining & Improvement Co. Later he was made Consulting Engineer of the Charleston, Cincinnati & Chicago, which is now the Ohio River & Charleston.

—Mr. Theodore Butterfield, who was recently appointed General Manager of the Ogdensburg & Lake Champlain (May 27, p. 382), began his railroad career in 1872 as chief clerk in the accounting department of the Utica & Black River. He was soon promoted to Cashier and Traveling Auditor. In 1874 he became General Passenger Agent, having been offered the choice of that office or that of Superintendent. Eight years later he was made General Freight and Passenger Agent of the U. & B. R., and occupied that office until the road was leased to the Rome, Watertown & Ogdensburg in 1886. Mr. Butterfield was then made General Passenger Agent of the R. W. & O. In March, 1891, the R. W. & O. was leased to the N. Y. C. & H. R. and Mr. Butterfield was retained as General Passenger Agent at Watertown, while all the other departments were consolidated. He resigned his office of G. P. A. on the R. W. & O. on May 18, this year, (May 20, p. 366), and on the same day was appointed General Manager of Ogdensburg & Lake Champlain.

—Additional appointments have been made by the President of officers for the Volunteer Regiments of Engineers as follows: First Lieutenants for the First Regiment U. S. Volunteer Engineers — Mr. Maurice A. Viele of New York, Assoc. M. Am. Soc. C. E.; Mr. Fitzhugh Lee, Jr., Washington, D. C.; Mr. Algernon Sartoris, Washington, D. C.; Mr. Carlos F. Carbonell and Mr. Carl Fisher Hanson of New York City.

Second Regiment, U. S. Volunteer Engineers to be Captains: Mr. Frederick J. H. Rickson of California and Mr. Alexander W. Cooke, who has already started to raise a company in the city of Chicago. Mr. Charles Kern of Colorado, has been appointed a Second Lieutenant in the Second Regiment.

In the Third Regiment U. S. Volunteer Engineers, Mr. John William Black of Illinois, and Mr. Walter Kirkprice of Ohio, have been appointed First Lieutenants. Mr. Hilary A. Herbert, Jr., of the District of Columbia, Mr. William S. Whitehead, Jr., of New Jersey, and Mr. Alfred Hamilton of Texas have been appointed Second Lieutenants in the Third Regiment.

—The partnership between Mr. Thomas Curtis Clarke, Past President Am. Soc. C. E., and Mr. Adolphus Bonzano, M. Am. Soc. C. E., which has existed since 1893, was dissolved some weeks ago—that is, they have decided not to take up any new work in partnership, but will finish work which they are now jointly interested in. Future consultation work, of which they have done a good deal in the past, they will now undertake independently. The office of Mr. Clarke is at 127 Duane street, New York city. He is Consulting Engineer of the Third avenue bridge, New York, also of the Willis avenue bridge, and, in connection with Sir Benjamin Baker, Consulting Engineer of the Ottawa Navigation Co., which it is supposed will soon begin improvement of the Ottawa River from Lake Huron to Montreal. This important work is designed to make a waterway for barges of 3,000 tons burden, and is expected to cost about $20,000,000.

Mr. Bonzano's address is 331 South Eighteenth street, Philadelphia. He is President of the Bonzano Splice Co., making a new rail joint, which has been ordered by the Pennsylvania Railroad Co. for four miles of track for experimental use. He has also in hand various enterprises as Consulting Engineer.

—Sir Robert Rawlinson died in London, May 31, in the 89th year of his age. He was the son of a mason and builder, learned his trade as mason, bricklayer and carpenter, and got such book learning as he acquired during his youth in the scanty intervals of hard physical work. When he was 21 years old he entered the office of Mr. Hartley, Engineer of the Liverpool Docks, and soon worked his way up to be chief draughtsman. From that time his progress as an engineer was rapid, and he finally came to be known as the father of sanitary engineering. He may be said to have originated in England the art of public water supply and sewerage, in which art he was long the leading light. He did other novel and important public service. He was sent to the Crimea during the Crimean war as engineering expert to investigate the sanitary condition of the camps and hospitals. He and his colleagues soon introduced measures for cleanliness and sanitation which reduced the death rate from 70 in the thousand to 12 or 14 in the thousand among those who entered the hospitals. He was knighted in 1889, became a member of the Institution of Civil Engineers in 1866, and its President in 1894.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—R. E. Smith, Superintendent of Motive Power with office at Wilmington, N. C., has not been promoted to the position of General Superintendent, as reported in this column last week (page 419), nor has Thomas H. Symington succeeded Mr. Smith as Superintendent of Motive Power. No change has been made.

Canada Eastern.—The annual election was held in Fredericton, N. B., June 7, and the following Directors were elected: Alexander Gibson, Alexander Gibson, Jr., Hugh H. McLean, James Gibson, F. E. Winslow, Fred Rowley and Charles H. Hatt.

Central of New Jersey.—G. O. Waterman, heretofore Auditor of Receipts and Disbursements, has resigned and the office of Auditor of Receipts and Disbursements has been abolished. W. W. Stevenson has been appointed Auditor of Disbursements. The appointment was effective June 1.

Chesapeake & Western.—O.H. P. Cornell, Superintendent, with office at Harrisburg, Va., has resigned, and A. P. Taliaferro has been appointed Acting Superintendent in his stead.

Chicago Terminal Transfer.—The following are the Directors as elected at the annual meeting held in Chicago, June 8: Edward D. Adams, S. R. Ainslie, Mark Breeden, Jr., Henry Budge, James H. Eckels, Fred T. Gates, Henry S. Hawley, Colgate Hoyt, Charles L. Hutchinson, Henry R. Ickelheimer, Kemper K. Knapp, E. R. Knowlton, William A. Read, John D. Rockefeller, Jr., and Henry A. Rust. At a meeting of the Directors held the same day the following officers were elected: President and Chairman of the Executive Committee, Edward D. Adams; Vice-President and General Manager, S. R. Ainslie; Secretary and Assistant Treasurer, George P. Butler; Treasurer and Assistant Secretary, Henry S. Hawley; Comptroller, J. H. McClement. Hereafter the annual meeting of the stockholders will be held on the second Wednesday of October.

Edward Shearson, Auditor, has resigned to accept the position of Auditor and Purchasing Agent of the American Steel & Wire Co. The appointment will be effective July 20. Mr. Shearson entered railroad service in 1885, as office boy in the Comptroller's office of the Chicago & Northwestern. He was appointed Auditor of Disbursements of the Wisconsin Central in February, 1889, and April 1, 1892, was elected Auditor of the Chicago & Northern Pacific and the Chicago & Calumet Terminal, now the Chicago Terminal Transfer.

Cincinnati, Hamilton & Dayton.—Sanford L. Parrot, formerly of the Passenger Department of the Memphis & Charleston, has been appointed Southern Passenger Agent of the C., H. & D., with headquarters at Atlanta, Ga.

Cleveland, Lorain & Wheeling.—Charles S. Stark, formerly Foreman of the Car Department of the C., L. & W. at Bridgeport, O., has resigned to accept a position as Chief Joint Car Inspector of the Baltimore & Ohio, the Pittsburgh & Western and the Pittsburgh Junction railroads in Pittsburgh, with office at Bennett, Pa. He is not in charge of all railroads running into Pittsburgh, as reported.

Duluth & Iron Range.—E. W. Winter of St. Paul, Minn., and George A. Brewster were elected Directors at the annual meeting held in Duluth, Minn., June 6, to succeed James Belden and the late Benjamin Brewster.

Duluth Short Line (St. Paul & Duluth).—At the annual meeting held in St. Paul June 8, J. D. Armstrong was elected a Director, succeeding L. S. Miller.

Eastern Ohio.—J. W. Campbell, General Manager, with office at Cambridge, O., has resigned. The office has been abolished and the duties assigned to W. H. Stevens, General Superintendent, with office at Cumberland, O. On April 18, 1891, Mr. Campbell was made General Manager of the E. O., which is successor to the Cincinnati, Wheeling & New York, of which he was Receiver from February, 1888.

Erie & Western Transportation Co.—At the annual meeting held in Buffalo, June 7, the following Directors were elected: William H. Barnes, George B. Bonnell, Frank J. Firth, F. S. Houston, Francis L. Potts and Benjamin Thaw. Mr. Firth is President and Charles E. Markham General Passenger Agent with office at Buffalo. The E. & W. T. Co. operates passenger steamers on the lakes during the navigation season between Buffalo, Erie, Cleveland and Detroit.

Erie & Wyoming Valley.—The following Directors were elected at the annual meeting held in Scranton, Pa., June 8: W. V. S. Thorne, New York; George B. Smith, Scranton, Pa.; A. H. McClintock, Wilkesbarre, Pa.; A. D. Blackinton, Dunmore, Pa.; Sidney Williams, Scranton; W. D. Decker, Dunmore; and Charles P. Savage. Mr. Smith is President.

Grand Trunk.—A. E. Bennett, previously Acting Solicitor, has been appointed Solicitor with office at Montreal, succeeding A. A. Strout.

Maine Central.—H. C. Sanderson, formerly Assistant Superintendent of the Springfield Division of the Boston & Maine, has been appointed Assistant Freight Agent of the M. C. with office at Portland, Me.

Mexican Railway.—E. Burdick, formerly with the Atchison, Topeka & Santa Fe, has been appointed General United States Agent of the M. Ry., with headquarters in New York City, the appointment taking effect July 1.

Minneapolis, St. Paul & Sault Ste. Marie.—Thomas Green has been appointed Acting Chief Engineer, succeeding W. W. Rich, previously Chief Engineer, resigned. (May 20, p. 366.) W. R. Collins, heretofore Claim Agent, has been appointed Freight Claim Agent, succeeding Adolph H. Bode.

Minnesota Transfer.—W. J. Underwood was elected a Director at the annual meeting held in St. Paul, June 8, succeding A. J. Earling of St. Paul.

New York & Pennsylvania.—The Directors, as elected at the annual meeting held in Hornellsville, N. Y., June 7, are: Morris S. Chase, Theodore Cobb, William Cobb, S. C. Crittenden, W. W. Crittenden, A. B. Paine, D. N. Rumsey, J. B. Rumsey, Frank Flohi, J. Newton Peck, George M. Webster, Benton McConnel and William Richardson. The following are the officers elected: President, William Cobb; Vice-President, Benton McConnel; Secretary, I. W. Near, and Treasurer, William Richardson.

Pecos Valley & Northeastern.—E. F. Draper is Auditor and Cashier of this company, which is successor to the Pecos Valley. (April 8, pp. 265 and 266). C. M. Stansbury is Master Mechanic. The principal office is at Colorado Springs, Colo.

Puget Sound & Gray's Harbor RR. & Transportation Co.—S. G. Simpson, previously General Freight and Passenger Agent, with office at Kamilchie, Wash., has been elected President, with office at Seattle, Wash. John A. Campbell was former President.

St. Louis, Kennett & Southern.—A. R. Ponder has been appointed General Superintendent with office at Kennett, Mo., succeeding Louis B. Houck.

St. Louis, Peoria & Northern.—W. J. Hemphill has been appointed Master Mechanic with office at Springfield, Ill., succeeding A. L. Moler.

Southwestern Alabama.—H. C. Prince has been appointed Acting Comptroller, succeeding C. T. Morel. James Menzies, heretofore Assistant General Freight Agent, has been appointed General Freight Agent with office at Savannah, Ga.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

ALBERENE.—This line from Warren, Va., on the Chesapeake & Ohio, north 10 miles to the Alberene soapstone quarries, is reported completed. C. D. Laughorn of Greenwood, Va., is President. (April 15, p. 284.)

ATCHISON, TOPEKA & SANTA FE.—The Santa Rita line, from San Jose, N. M., near Silver City, up the north side of the Santa Rita Creek to Santa Rita, about four miles, is completed. (Jan. 28, p. 70.)

CHICAGO & NORTHWESTERN.—Raulsen & Larsen of Minneapolis, Minn., are reported to have the contract for the 2-mile extension of the Belt line around the city of Manitowoc. Wis. (April 8, p. 265.)

CHICAGO GREAT WESTERN.—Surveys have been resumed, according to report, for an extension from Hampton, Ia., southwest 38 miles to Webster City, and thence to Sioux City. Reports of over a year ago stated that the right of way was then being contracted for. (March 5, 1897, p. 177.)

DULUTH & NEW ORLEANS.—This company has been incorporated in Iowa with a capital stock of $300,000 to build a line connecting points in Minnesota and Iowa, and to buy lines for extensions toward the South. The incorporators are: Robert B. Hunter, Topeka, Kan.; H. C. Arnold, Minneapolis, Minn.; G. W. Lamka, New Hampton, Ia.; T. V. Wardall, S. V. Wardall, Thomas Wardall and N. A. Wardall, Osage, Ia.

GREAT NORTHERN.—A. Guthrie & Co. have the contract for building the connecting line from Akeley, Minn., to the Fosston Branch. About two-thirds of the work is done. The maximum grade is 0.6 p. c. and the maximum curvature 3 deg. There are no steel bridges. On the extension of the Fosston Branch from Fosston east to Duluth, also under contract to A. Guthrie & Co., work is being pushed with vigor. (May 27, p. 383.) Grading is to be finished in about a month and track has been laid from Deerwood to the Mississippi River, 10 miles, and also for

14 miles at the Duluth end of the line. (Official.)

Regarding the improvements, grades, bridges, etc., on the 610 miles of road on the main line between Larimore, N. D., and Havre, Mont., for which Messrs. Guthrie & Co., of St. Paul, have the contract, the work consists of widening embankments and change of line where necessary for short distances and reducing grades. Two large steel bridges are to be built, one at Gassman Coulee, 1,760 ft. long, and the other at Big Mary's Coulee, 400 ft. long. (Apr. 22, p. 300.)

It is reported that 60 acres of land have been bought in South Crookston, Minn., where freight yards will soon be built.

GREAT NORTHWEST CENTRAL.—The extension to be built this year west from Hamiota, Man., will be 50 miles long. (May 27, p. 383.)

GULF, CHICKASAW & KANSAS.—This company was incorporated in Kansas, June 8, with a capital stock of $1,500,000, to build a line from Peru, Chatauqua County, on the Missouri Pacific and Atchison, Topeka & Santa Fe roads, to run south nearly 600 miles through Indian Territory to Galveston, Tex. The Directors are: Ben S. Henderson, L. C. True and M. P. Freligh of Kansas City, Kan.; G. W. Fitzpatrick, George L. Walls, C. R. Martin and S. E. Douglass of Kansas, Mo.

GULF, TEXAS & NORTHERN.—Work is to begin soon, according to report, on this line, incorporated in Texas, June 3, with a capital stock of $200,000, to run from Orange, Tex., north about 200 miles through the counties of Orange, Newton, Jasper, Sabine, San Augustine, Shelby, Panola and Harrison to Marshall. The incorporators are: D. C. Plumb, C. W. Higgins, John B. Mesney, James C. Beeks, Chicago, Ill.; S. W. Sholans, W. W. Reid, George W. Bancroft, Orange, Tex.; L. W. Lloyd, George Lake and Paul G. Whaley, Marshall, Tex. (June 3, p. 309.)

INTERCOLONIAL.—Tenders addressed to L. K. Jones, Secretary of the Department of Railways and Canals, Ottawa, Ont., will be received up to noon Aug. 2, for 1,000 tons of 50-lb. rails and fastenings to be delivered on the Prince Edward Island Ry. wharf at Summerside, P. E. I., and for 5,000 tons of 80-lb. rails and fastenings to be delivered on the Intercolonial wharf at St. John, N. B., all to be delivered in April, 1899. Specifications will be ready after June 20 on application to the Secretary, and at the office of the High Commissioner of Canada, London, England.

KANSAS CITY, NORTHEASTERN & GULF.—Work is to be begun soon, according to report, on this proposed line from Kansas City, Kan., south to a point on the Gulf of Mexico in Texas. Recently Congress passed a bill granting the company right to build a bridge across the Missouri at Quindaro to connect the main line with a branch from Kansas City to connect Bethany, Mo., via Platt City and Plattsburg. J. J. Squires is President. (May 28, 1897, p. 381.)

KANSAS CITY, OSCEOLA & SOUTHERN.—Rails are being laid on the extension from Osceola, Mo., southeast 38.3 miles to Bolivar, and it is expected that the line will be completed about July 1. This road is being built by arrangement with the St. Louis & San Francisco to give that company a through line from Kansas City to the Gulf. (April 22, p. 300.)

KEOKUK & WESTERN.—Bonds for $2,500,000 have been arranged for with the Metropolitan Loan & Trust Co., New York, for the extension from Cainsville, Mo., southwest about 30 miles to Pattonsburg, where connection will be made with the recently completed Kansas City & Northern connecting line of the Kansas City, Pittsburgh & Gulf. (April 1, p. 245.)

LAKE ERIE & WESTERN.—Contracts are to be let soon, according to report, for the eastern extension of the Northern Ohio from Akron, O., 85 miles, via Ravenna to Newcastle, Pa., where connection is to be made with the Buffalo, Rochester & Pittsburgh extension, now building. (April 15, p. 285.)

MEXICAN INTERNATIONAL.—Over 200 men, according to report, are at work on the extension from Durango, Mex., west about 150 miles to Port Mazatalan, on the Pacific coast. (March 25, p. 224.) Work is to begin shortly, it is stated, on a branch from Durango south about 250 miles to connect with the Mexican National at Guatalajara.

MICHIGAN CENTRAL.—It is reported that this company contemplates increasing the size of its yards at Detroit. Legal proceedings were begun June 9 to secure the right of way for this extension.

NEW ENGLAND.—At a special meeting of the stockholders, held at Hartford, Conn., June 14, it was unanimously voted to ratify the action of the Board of Directors in leasing the property for 99 years from July 1 to the New York, New Haven & Hartford. (May 27, p. 384.)

NEW ROADS.—M. McAvoy is reported to have obtained a contract for building three miles of railroad for the Wetmore Lumber Co. at Wild Cat, Pa., and operations are to begin in a few days.

Balch & Peppard of Minneapolis, Minn., contractors for the 2¾ miles of road to connect the Arnold and the Copper Falls Mines near Houghton, Mich., have shipped their outfit with about 80 men to that place, and work is to be begun at once. (May 20, p. 367.)

The Mexican Sulphur Mining Co., controlled by capitalists of Pittsburgh, Pa., proposes to build a railroad from Yuma, Mex., near the boundary line on the Colorado River, west about 150 miles through Mexico and California to San Diego. The plan includes a branch south to the sulphur mines, which are located on the Rio Colorado about 20 miles from its mouth. Representatives of the company are in Mexico City seeking a concession. The project is being stimulated by the increased prices of sulphur due to the war. J. A. Dubbs, of Ventura, Cal., is manager of the sulphur company.

The Pacific Coast Borax Co. of San Francisco, Cal., is building a line from Daggett on the Santa Fe Pacific to its mines at Borati, nine miles. The grades up the mountain are as high as 8 p. c. F. M. Smith of San Francisco is President.

PENNSYLVANIA CO.—The proposed extension of the new Cumberland Branch in Virginia is from Kennilworth, the present terminus, to Chester, opposite East Liverpool, O. It will follow the left bank of the Ohio, and the building will involve no features of unusual character, being for the most part a hillside location. The work has not been placed under contract as yet, and the project is merely tentative. (Official.)

PHILADELPHIA & READING.—Ten additional tracks are being placed in the yards at Newberry Junction, Pa.

QUEBEC, MONTGOMERY & CHARLEVOIX.—This company, whose line extends from Hedleyville, a suburb of Quebec, northeast along the north bank of the St. Lawrence, 30 miles, to Cape Tourment, will take over the property of the Quebec District Ry. on or before July 1, and the steam road is to be electrified as soon as possible after that date. (Electric Railroad Construction, June 10, p. 421.)

RESTIGOUCHE & WESTERN.—Messrs. Malcolm & Ross of St. Leonards, N. B., have obtained a contract to build this road, which is proposed to run from a point on the Bay of Chaleurs southwest about 110 miles to the St. John River in New Brunswick. (Feb. 18, p. 130.)

SAN FRANCISCO & SAN JOAQUIN VALLEY.—The first steel for the Point Richmond extension from Stockton, Cal., west to Point Richmond, opposite San Francisco, has arrived at Stockton, and other supplies are reaching that city for this extension and for the branch between Visalia and Waukena, where Grant Bros. have a grading force. (May 27, p. 383.)

SOUTHERN.—Preliminary surveys are reported completed for the proposed line from Stevenson, Ala., northeast about 40 miles to Chattanooga, Tenn. (April 8, p. 266.)

SOUTHERN PACIFIC.—H. E. Huntington, First Assistant to the President, has given orders to push along the work of closing the 55-mile gap from Elwood, Cal., northwest to Surf, which will make a complete line near the coast from Santa Barbara to San Francisco. It is stated that 96 horses and 70 men are at work near Surf, 70 horses and 60 men at San Miguel and 65 horses and 60 men between Gonzales and Soledad. Other teams and men are to be put on as rapidly as needed. (May 13, p. 349.)

An extension of the Visalia Branch from Visalia, Cal., southeast about 8 miles to Exeter, on the Porterville line, will be built as soon as all the right of way is acquired. The route is surveyed and is ready for cross-sectioning.

WESTERN AMERICAN COAL CO.—Bids were to be awarded June 14 for this proposed mining road from Carbonado, Wash., on the Northern Pacific, to the mines of this company at Fairfax, 7 miles. The bids call for work as follows: Clearing, 35 acres; earth work, 67,000 yards; hard pan, 4,000 yards; loose rock, 17,000 yards; solid rock, 18,000 yards; cribbing, 14,000 lineal feet, stumpage furnished; piling, 5,000 lineal feet, stumpage furnished; ties, 18,000, stumpage furnished; lumber, half-million feet; wrought iron, 25,000 pounds; cast iron, 10,000 pounds. T. B. Corey of Seattle, Wash., is General Manager. (May 20, p. 367.)

WESTERN MARYLAND.—About four miles of grading is completed on the extension of the Washington and Franklin cut-off from Hagerstown, Md., to a point near Altenwald, Pa. (May 20, p. 367.)

Electric Railroad Construction.

ALLENTOWN, PA.—The Council of Kutztown passed an ordinance giving the Allentown & Kutztown Traction Co. the franchises sought for in the town. (April 8, May 13, pp. 266, 349.)

BLOOMINGTON, ILL.—The Bloomington & Normal Ry. was incorporated with a capital of $250,000. The incorporators are A. E. Demange, John Graham and George McIntosh. This incorporation is very likely the reorganization of the Bloomington City Ry. It is stated that about $50,000 will be spent in improving the plant. (June 10, p. 422.)

BOSTON, MASS.—The Boston, Milton & Brockton St. R. R. Co. was recently incorporated with a capital stock of $80,000, to build an electric railroad eight miles long between the boundary line of Boston and Milton, through Milton, Quincy and Randolph to "West Corners." Bradford Hamilton is Treasurer.

CHICAGO, ILL.—The Northern Electric Railway Co., now operating five miles of track, has asked for a franchise on three miles of streets in the 27th ward.

A new ordinance is introduced granting a franchise to the Wisconsin, Inland Lakes & Chicago Railway Co. The old ordinance was sent to the Committee on Railroads and never sent back. The line, as planned, inside the city limits begins at Pacific Junction and parallels the line of the Iowa division of the Chicago, Milwaukee & St. Paul. It proposes to lay its tracks under ground most of the distance within the city limits. It will tunnel beneath the river and have its city terminus on Kingsbury St., near Kinzie. (Jan. 28, p. 71.)

ELIZABETH, N. J.—The Elizabeth St. Ry. Co., now operating with horses, proposes to change to trolley. The company has about 3½ miles of track, and further extensions of franchise are sought for.

HAMILTON, ONT.—The Hamilton St. Ry. Co. will probably build lines on Stinson, Wellington, Hunter and Catharine Streets.

HARRISBURG, PA.—The Harrisburg Traction Co. will build an extension to Rockville, about 5 miles.

IOLA, KAN.—The Iola Rapid Transit Co. is reported incorporated with a capital of $10,000, to build an electric railroad from Iola to Moran. Among the incorporators are: W. S. Hendricks, Geo. A. Bowlus and Wm. J. Evans.

LOS ANGELES, CAL.—The Los Angeles Pacific Ry. has been formed by consolidation of the Pasadena & Pacific Ry. companies of Arizona and California, etc. The new company has an authorized capital stock of $1,000,000 in $100 shares, and will make a mortgage to secure $1,000,000 of 30-year 5 per cent. bonds. Of these bonds $750,000 are to be used to retire the bonds of the Pasadena & Pacific Ry., dollar for dollar, and the remainder for improvements, extensions and new equipment. The Directors are: J. Ross Clark, E. P. Clark, W. D. Larrabe, John D. Pope, M. E. Hammond, A. I. Smith, all of Los Angeles, and M. H. Sherman of San Francisco. (Jan. 14, p. 35.)

MILLBRIDGE, ME.—A company is formed to build an electric railroad between Millbridge and Cherryfield. Among those interested are: W. M. Nash, Cherryfield; H. H. Gray, F. W. Sawyer and J. Wyman, Millbridge.

MONTREAL, QUE.—At a recent meeting of the stockholders and creditors of the Montreal Park & Island Ry. Co., President Holt explained that although the road was thoroughly equipped and the receipts increasing, nevertheless certain old liabilities had to be met shortly and this hampered the directorate. Further, large blocks of stock had been issued to the original promoters, and he with his fellow directors believed that in fairness to all concerned a reorganization of the company was absolutely necessary. The following committee was appointed to draft a plan of reorganization: Mr. Holt, for the Directors; Mr. Beique, Q. C., for the bondholders and Montreal Construction Co.; the Hon. Mr. Geoffrion, for the Banque du Peuple and the Seminary of Quebec, and Mr. William Strachan, for the shareholders. The following, Edwin Hanson, S. H. Ewing, A. A. Thibaudeau and David Morrice, trustees of the bonds, were appointed to act as receivers until the plan of reorganization is complete.

NEW YORK, N. Y.—The Pelham Electric Light & Power Co., it is stated, has secured options on the Pelham Park and City Island horse roads and will probably buy the franchises and property and change the motive power.

NIAGARA FALLS, ONT.—The Niagara Falls Park & River Ry. Co. (Canadian Scenic Route) has secured the privilege of operating cars on the new Niagara arch.

PHILADELPHIA, PA.—An ordinance was introduced June 10 to give the Germantown & Fairmount Park St. Ry. Co. permission to build its line connecting the Falls of Schuylkill and Manayunk with Germantown. (Feb. 25, March 4; pp. 149, 170.)

PITTSBURGH, PA.—The Monongahela St. Ry. Co. has absorbed the Homestead & Highlands, the Braddock & Homestead and the Braddock & Duquesne St. Ry. companies (the latter road now being built), by an agreement of consolidation or merger dated May 26, 1898. It is the intention of the Monongahela company to rebuild the old lines and build the necessary new lines to form a continuous double track road from the boroughs of Braddock, Duquesne and Homestead, passing through the boulevard and park district of Pittsburgh and entering the business portion of that city by virtue of a trackage agreement with the Consolidated Traction Co. The Monongahela St. Ry. Co. has a capital stock of $1,000,000, fully paid up, and has authorized a bonded indebtedness of $1,000,000. When the work now under way is completed the company will own about 17 miles of double track, including branches, and will have, under its agreement with the Consolidated Traction Co., 5 additional miles, making the total operated 22 miles. The road is to be improved throughout and fully re-equipped with new rolling stock. This work is now under way and it is expected will be completed early in September.

PLAINFIELD, N. J.—The Plainfield St. Ry. Co. will build an extension on East Second St.

PROVIDENCE, R. I.—The Providence & Taunton St. Ry. Co. has filed articles of incorporation; capital stock $160,000. J. A. King is Clerk, and F. E. Perkins Treasurer. The road will be about 14 miles long and in Massachusetts will run from the Rhode Island State line through Seekonk, Rehoboth and Dighton to City Sq., in Taunton. Messrs. Tucker, Anthony & Co., 53 State St., Boston, will finance the road. (Jan. 28, p. 7.)

QUAKERTOWN, PA.—The Quakertown & Richlandtown Trolley Co. opened its line June 12. An extension to Hellertown, Bethlehem and Allentown will soon be begun. C. Taylor Leland is President.

REDLANDS, CAL.—Local papers say that Henry Fisher, President of the Southern California Power Co., obtained a controlling interest in the Redlands St. Ry. Co. by buying the stock owned by the First National Bank of Redlands. This is a horse road 2.5 miles long, and will be changed to trolley.

RICHMOND, VA.—The South Side Ry. & Development Co., chartered March 3, has petitioned for a franchise to build a trolley road. Phil P. Shield, Attorney.

SAN DIEGO, CAL.—The San Diego Electric St. Ry. Co. has applied for authority to lay heavier rails. The rails common on the road now are 30, 40 and 52½-lb. T and girder.

STAUNTON, VA.—An electric railroad is proposed to run from Staunton to Seawright Springs, 11 miles. E. L. Edmonson, proprietor of the Seawright Magnesium Springs Co. of Staunton, is interested.

WASHINGTON, D. C.—Press reports state that the House Committee on the District has made a favorable report upon the bill giving a right of way within the District to the Washington, Woodside & Forest Glen Ry. & Power Co. of Montgomery County, Md. The company will enter Washington over the tracks of the Brightwood Ry. Co.

WILMINGTON, DEL.—The following were elected Directors of the Wilmington & Brandywine Springs Ry. Co.: Robert C. Justis, Joseph H. Coates, Charles W. Atmore, Richard W. Crook and Dr. L. H. Ball. The Directors elected the following officers: Robert C. Justis, President; Dr. L. H. Ball, Secretary and Treasurer; Richard W. Crook, General Manager. This road is building and nearly completed. (Aug. 13, 20, Sept. 17, Dec. 3, '97; pp. 579, 596, 659, 861; May 20, '98, p. 367.)

GENERAL RAILROAD NEWS.

Railroad Earnings.

Showing the gross and net earnings for the periods ending at the dates named:

April 30:		1898.	1897.	Inc. or Dec.	
Chicago & Eastern Illinois.					
10 months	Gross	$3,566,609	$3,317,219	I.	$249 390
10 "	Net	1,566,604	1,457,473	I.	109,131
Chicago, Indianapolis & Louisville.					
1 month	Gross	$279,209	$246.978	I.	$32,231
1 "	Net	87,293	75.747	I.	11.546
10 months	Gross	2,768,697	2,360,842	I.	407,855
10 "	Net	800,049	668,123	I.	131,926
Flint & Perre Marquette.					
1 month	Gross	$237,767	$236,490	I.	$1,277
1 "	Net	57,074	55,201	I.	1,873
4 months	Gross	958,082	901,529	I.	56,553
4 "	Net	215,698	215,834	D.	136

April 30:		1898.	1897.	Inc. or Dec.	
Illinois Central.					
1 month	Gross	$2,119,390	$1,614,422	I.	$504,968
1 "	Net	531,142	361,217	I.	169,925
10 months	Gross	22,944,578	18,485,985	I.	4,458,593
10 "	Net	7,364,872	5,628,949	I.	1,735,923
Kansas City, Fort Scott & Memphis.					
1 month	Gross	$395,603	$351,382	I.	$44,221
1 "	Net	125,345	96,360	I.	28,985
10 months	Gross	4,318,868	3,867,128	I.	451,740
10 "	Net	1,354,786	1,237,013	I.	117,773
Mobile & Ohio.					
1 month	Gross	$318,871	$273,058	I.	$45,813
1 "	Net	26,216	9,168	I.	17,048
10 months	Gross	3,543,365	3,241,035	I.	302,330
10 "	Net	1,162,012	1,102,622	I.	59,390
Philadelphia & Erie.					
1 month	Gross	$332,873	$309,784	I.	$23,089
1 "	Net	109,753	100,385	I.	9,368
Rio Grande Western.					
1 month	Gross	$274,456	$199,678	I.	$74,778
1 "	Net	120,652	78,343	I.	42,309
10 months	Gross	2,769,485	2,011,532	I.	757,953
10 "	Net	1,059,178	667,174	I.	392,004
Union Pacific.					
1 month	Gross	$1,242,427	$1,107,949	I.	$134,478
1 "	Net	512,785	301,016	I.	211,769
4 months	Gross	4,920,139	4,233,191	I.	686,948
4 "	Net	1,923,680	1,241,104	I.	682,576

May 31:		1898.	1897.	Inc. or Dec.	
Chicago Great Western.					
1 month	Gross	$444,564	$387,035	I.	$57,529
11 months	Gross	4,912,229	4,290,675	I.	621,554
Nashville, Chattanooga & St. Louis.					
1 month	Gross	$526,038	$444,393	I.	$81,645
1 "	Net	213,387	166,851	I.	46,536
11 months	Gross	5,224,263	4,652,877	I.	571,386
11 "	Net	1,825,089	1,731,547	I.	93,542
New York Central & Hudson River.					
1 month	Gross	$3,944,945	$3,808,730	I.	$136,215

CATAWISSA (P. & R.),—This company has made a first consolidated mortgage to the Pennsylvania Co. for insurance on lives and granting annuities, as trustee, to secure $2,215,000 of 4 p. c. 50-year gold bonds. Of these $1,530,500 are reserved against the $1,300,000 7 per cents., due 1900, and the $230,500 6 per cents., due 1902. The remainder of the loan is used to retire other bonds of the company, including $98,450 which matured July 1, 1888, but has been carried as a floating debt.

CENTRAL OHIO.—Judge Taft, at Cincinnati, O., on June 4, in the case of Black, Fanestock and others vs. the C. O., decided that the plaintiffs had no case for the appointment of a receiver separate from that of the Baltimore & Ohio, and the motion for such appointment was overruled. (Jan. 14, p. 35.)

CHICAGO & EASTERN ILLINOIS.—Two Indiana Block Coal Co.'s bonds for $1,000 each and one for $500 have been drawn for payment for the sinking fund at the Farmers' Loan & Trust Co., New York, interest to cease after July 1.

CHICAGO & NORTHWESTERN.—Holders of Chicago & Milwaukee first mortgage 7 p. c. bonds ($1,641,000 outstanding), which mature July 1 next, are notified that the treasurer will pay them at 52 Wall street, New York City, on or after that date. Kuhn, Loeb & Co., of New York, are prepared to refund these bonds into new general mortgage 3½ p. c. gold bonds at 101 and accrued interest. This is in conformity with the refunding plan. (Dec. 10, 1897, p. 879.)

CHICAGO & SOUTHEASTERN.—W. C. Fouce, of Crawfordsville, Ind., has filed a petition calling for a dissolution of the company and the appointment of a receiver under a claim held by him for about $800. (April 29, p. 318.)

CHICAGO TERMINAL TRANSFER.—At the annual meeting of the stockholders held at Chicago, June 9, the purchase of the Chicago & Calumet Terminal Ry. was authorized, together with a new issue of first mortgage bonds for this purpose and for extensions. The C. & C. T., which runs from McCook, Ill., to Clark Junction, 29.1 miles, and from East Chicago, Ill., to Whiting, Ind., 4.31 miles, with branches and spurs making a total of 44.46 miles, has been operated under lease by the C. T. T., formerly the Chicago & Northern Pacific.

DENNISON & NORTHERN.—Judge Townsend, at Ardmore, I. T., June 3, handed down a decision in which he holds that in 1892 Bracy, Lampson & Chapman entered into a contract with the D. & N. to build 71 miles of its line, for which payment was to be received in stocks and bonds of the company. Bracy, Lampson & Chapman failed to comply with their contract, and the D. & N. later was placed under a receiver through a suit of some of the engineers who located the line. The receiver, under authority of the court, made a contract with the Mineral Belt Construction Co. to build the line and pay for the same in receiver's certificates at the same rate of $11,000 per mile. Under this latter contract several miles of grading was completed, but no rails laid. Judge Townsend holds that this contract is void, together with the receiver's certificates issued to the company, and decrees that apprisal be made of the property, which apprisement shall constitute a charge against the property of the railroad. All persons holding claims against the road are ordered to present them within a reasonable time. On Mar. 14 Judge Taft issued an order annulling the appointment of a receiver. (Mar. 25, p. 226.)

ERIE.—New York, Pennsylvania & Ohio equipment trust bonds to the amount of £10,600 were drawn for payment June 1 for the sinking fund at 24 Basinghall street, London.

GREAT NORTHERN.—A recent circular issued by the company gives details of a proposed increase of $25,000,000 in preferred stock, the proceeds of which are to be used for redeeming the $15,000,000 4 p. c. collateral trust bonds, which have been called in for Sept. 1, and for buying the $12,500,000 capital stock of the new Seattle & Montana for a sum not to exceed $10,000,000. Stockholders of the G. N. will be entitled to subscribe at par for one share of new stock for each share of their holdings of preferred stock outstanding on July 1. Subscriptions to the new preferred stock are not to be considered binding until 75 p. c. of the present outstanding preferred stockholders file their subscriptions. The purchase price will be payable Aug. 1 and must be in cash or in the collateral trust bonds of the G. N. at par. (June 3, p. 420.)

ILLINOIS CENTRAL.—The New York Stock Exchange has listed $2,500,000 additional stock of the I. C., which is part of the $10,000,000 authorized by the stockholders in November, 1895, which was to be sold at not less than par to raise funds "for completing, maintaining and improving the lines of the I. C. RR. Co. and of discharging the indebtedness incurred for said purposes."

MINNESOTA TRANSFER.—At the annual meeting held at St. Paul, Minn., June 8, it was decided by a vote of 7 to 1 to buy the New Brighton Stock Yards property and the Minnesota Belt Ry. & Transfer Co.'s line, which extends around Minneapolis and St. Paul, 14 miles. The M. T. Co. was chartered in 1883, and is controlled by the St. Paul, Minneapolis & Manitoba, the Northern Pacific, the Chicago, Milwaukee & St. Paul, the Chicago, St. Paul, Minneapolis & Omaha, the Minneapolis & St. Louis, the Chicago Great Western, the Wisconsin Central and the Chicago, Burlington & Northern, all of whose freight coming to the two cities is transferred over this line. Another meeting will be held June 22 to ratify the decision.

NEW YORK & OTTAWA.—This company has asked permission from the New York State Board of Railroad Commissioners to increase its capital stock from $1,480,000 to $3,000,000, and a hearing is to be given at Syracuse June 21. The purpose of the increase is to acquire the stock of the Ottawa & New York of Canada and the Cornwall Bridge Co., whose bridge spans the St. Lawrence River. When completed the line is to extend from Ottawa, via Cornwall, to Tupper Lake, N. Y., where connection is made for New York City with the Adirondack RR of the Delaware & Hudson Canal. Spencer D. Trask & Co., New York City, are among the financial backers of the road. (Jan. 21, p. 50.)

NEW YORK, PHILADELPHIA & NORFOLK.—Holders of first mortgage 6 p. c. bonds are notified that under the plan of reorganization the present rate of interest ceases after July 1, and that bonds not deposited with Messrs. Cassett & Co., Philadelphia, on or before that date (to be paid at par and accrued interest) will not be allowed to participate in the plan of reorganization. Messrs. Cassatt & Co. state that about 90 p. c. of the stock and income bonds and about two-thirds of the first mortgage bonds have assented to the proposed plan of reorganization. (April 22, p. 302.)

NORTHERN PACIFIC TERMINAL CO.—The Northern Pacific and the Oregon Railway & Navigation companies will resume their respective shares in the lease of the Northern Pacific Terminal Co., which was terminated under the receiverships of those roads.

OGDENSBURG & LAKE CHAMPLAIN.—The ownership of this property was transferred June 1 to the purchasing committee, Charles R. Batt, of Boston, and William Lummis, of New York, who bought the road under foreclosure May 2. (May 6, p. 334.)

PENNSYLVANIA.—Holders of West Jersey & Sea Shore first consolidated 4 p. c. bonds are notified that sealed proposals will be received up to July 1 at the office of the company, Philadelphia, for $16,000 at a rate not to exceed par, exclusive of the interest payable at that date.

RUTLAND.—This company will redeem its $1,230,900 second mortgage 5 p. c. 20-year bonds due Aug. 1, 1898, with the proceeds of new 4½ p. c. bonds authorized for this and other purposes. The old second mortgage bonds are a first mortgage on the rolling stock and personal property.

STUTTGART & ARKANSAS RIVER.—A decree of foreclosure for $637,500 was rendered in the United States Court at Little Rock, Ark., June 11, against this company in favor of the Farmers' Loan & Trust Co. of New York, which owns the bonds of the railroad company. The Court ordered the road to be sold at foreclosure Aug. 2. This line runs from Stuttgart, Ark., to Gillett, 41 miles. It has been in the hands of a receiver since Aug. 20, 1895. Its capital stock is $500,000 and its funded debt $375,000.

UNION PACIFIC.—The receivers have advertised for sale various railroad mortgages of the old company of the nominal value of $7,267,823.

UNION PACIFIC, CENTRAL BRANCH.—The Borg Committee, under the authority of the bondholders' agreement of March 9, 1896, has adopted a plan of reorganization which, in order to become effective, must receive the assent of holders of 60 p. c. of the par value of certificates held by the Union Trust Co., New York. The plan calls for an issue of first mortgage 4 p. c. 50-year gold bonds, dated June 1, 1898, with interest payable semi-annually on June 1 and Dec. 1 each year, $2,500,000; also an equal amount of capital stock. Holders of the old Atchison & Pike's Peak first mortgage 6 p. c. bonds and of the Central Branch of the U. P. funded coupon 7 p. c. bonds (with all unpaid coupons attached) will receive for each $1,000 bond $1,120 in new 4 p. c. bonds, $200 in cash and such further sum, not exceeding $75, as the committee may obtain from funds now held or that hereafter may come into the hands of the receivers. This cash payment is in lieu of stock, which, under the reorganized company, it is understood, is to be controlled by the Missouri Pacific.

WABASH.—The directors have decided not to pay July interest on the A debenture bonds, although the estimated earnings for the year will show a surplus of between $400,000 and $500,000. This surplus is to be used to reduce the floating debt, which, exclusive of car trusts and current accounts, amounts to about $400,000. These debenture bonds received no interest in 1897, 1895 nor 1894, but were given 1 p. c. in 1896, and 6 p. c. from 1891 to 1893, inclusive.

WISCASSET & QUEBEC.—All the stations, platforms and water tanks used by this company in the towns of Ulma and Whitefield, Me., were sold at sheriff's sale June 3 and 4 to B. F. Ware, of Whitefield, Me. This property was built by Mr. Ware and sold on a mechanic's lien put on by him. (Apr. 1, p. 302.)

WISCONSIN CENTRAL.—F. R. Hunt, I. W. Chick, A. H. Harty, T. Jefferson Coolidge, Jr., Charles R. Belt, W. F. Lyman and others, holders of income bonds, have filed petitions in the United States Circuit Court at Milwaukee, Wis., to be made parties defendant in suits now in court with reference to this road. (June 10, p. 422.)

Electric Railroad News.

CHICAGO, ILL.—Chicago papers say that the franchises and rights of the General Electric Ry. Co. were sold to the Chicago City Ry. Co. for $950,000. The General Electric Ry. Co. received its first franchise in January, 1896, and additional franchises were granted in February, 1897. In April, 1897, the company was reported to have advertised for bids for building a small part of the road, and we believe work was begun.

LOCK HAVEN, PA.—Robert H. Irvine, Manager of the Lock Haven Traction Co., has resigned to engage in street railroad building in St. Louis, Mo.

OAKLAND, CAL.—The Directors of the Oakland Transit Co. will meet July 6 in Oakland, to act on the proposition to create a bonded indebtedness of $1,400,000, gold, part of which to be used in retiring existing bonds.

TRAFFIC.

Traffic Notes.

The War Department has made a contract with the Pullman Palace Car Co. for a train of 12 cars for carrying sick and wounded soldiers from Florida to the camp at Chickamauga. There will be 10 tourist sleeping cars, a dining car and one car for the surgeons and attendants.

The National Association of Merchants and Travelers, at a meeting held last week in Chicago, adopted a resolution favoring the passage of the anti-scalping bill now before Congress. The resolution is concurred in by organizations in St. Louis, Kansas City, St. Joseph, Des Moines, St. Paul and Minneapolis.

The special meeting of the Western Passenger Association called for this week is to take up questions of regulation of reduced rates to meet Canadian Pacific competition. The proposition pending is to handle all this business, both east and westbound, on rebate orders, as is now being done with the eastbound tickets.

The Chicago & Milwaukee (Steamboat) Transportation Co. has issued circulars offering an annual pass and a premium of $25 to each couple who will be married this summer on the company's vessel, the Christopher Columbus. Brides and bridegrooms too bashful to be thus married, but who will ride on the steamer, are offered a trip pass.

The Western railroads centering in New York City have revised the rules for storage of freight, which were issued a few weeks ago. The free time for flour will be 20 days wherever the same is stored. This rule supersedes the former regulation allowing only four days at New York stations, while flour to be delivered by the railroads by lighters was allowed 20 days.

Joint Traffic officials are worried over the action of the West Shore and the Lehigh Valley in entering the fight against the Canadian Pacific. It was hoped to keep this war out of Eastern territory, but the pressure from the Western lines was too strong. It is reported that one or more of the "Standard" lines are nearly ready to take a hand in the fight, having become restless over the action of the West Shore.

Railroads carrying grain from the West to Milwaukee have made reductions in the tariffs, varying from ½ cent to 1½ cents, averaging, it is said, less than one cent. The readjustment is made at about 600 stations, in five states. This action is pursuant to the recent decision of the Interstate Commerce Commission, that rates to Milwaukee are too high in proportion to the rates on similar goods to Minneapolis; but the Milwaukee merchants say that the reduction is so small that it will be of doubtful benefit to them.

The Joint Passenger Committee has recently had several conferences with representatives of the Alton over a proposition of the latter to sell tickets from Southwestern points to Joint Traffic territory via Chicago, at short-line rates (via St. Louis). The Eastern lines have heretofore refused to allow this. A compromise proposition is now pending before a sub-committee, to permit the sale of continuous passage tickets via Chicago, Eastern lines to receive their full Chicago proportions, and the Western lines to absorb the difference.

The Treasury Department has approved the bill now before Congress allowing imported goods to be shipped in bond to interior cities in any quantity and without being separated from "free" merchandise. Packages are to be corded and sealed by custom officers, this seal taking the place of a Government seal lock on the car door. This scheme, which has been worked up in the Local Freight Agents' Association, will facilitate bond shipments in small lots, the necessity of accumulating a carload of bonded freight for a single city being obviated.

The Interstate Commerce Commission has refused to recommend a reduction in the rates on melons over the Florence Railroad, on complaint of the South Carolina State Railroad Commission. The complaint averred that the rates on melons to New York and other Northern points were unjust and unreasonable; but it appeared that they were lower thon those on cotton and general merchandise, while the speed was higher and additional facilities had to be furnished. The prevailing rates were from 7.6 mills to 11 mills per ton per mile, and on most of the defendant routes they were less than the average receipts from all freight.

The Interstate Commerce Commission's suit to enforce its order concerning rates from New York to Chattanooga is still unsettled, and the Commission's order has not been enforced. The case has now gone to the United States Circuit Court of Appeals. The original complaint was that rates from New York and other Eastern cities, by water part of the way, were higher to Chattanooga than to Nashville, thus violating the fourth section. On Dec. 30, 1892, the Commission issued a decision against the railroads, but the order was not obeyed, and suit was brought in the Circuit Court for the Eastern District of Tennessee. This suit was decided last February by Judge Severans, in favor of the Commission; but, as before stated, it has now been taken to the higher court.